SKP ENGINEERING COLLEGE

DEPARTMENT OF

ELECTRONICS AND COMMUNICATION ENGINEERING

HAND-OUT

VISION OF THE INSTITUTION

To develop center of excellence in technical education with innovation and perform research in cutting edge technologies with practical skills and attain rural empowerment

MISSION OF THE INSTITUTION

To impart world class Technical education with creativity to the students community in particular to rural sector and to make them employable in reputed organizations

VISION OF THE DEPARTMENT

To create internationally competent Engineers and to develop a center of excellence for advanced technology and enhancement of knowledge in the field of Electronics and Communication Engineering for the rural community

MISSION OF THE DEPARTMENT

- ✓ To provide competent teaching learning process with broad instructional substance.
- ✓ To inculcate the research environment for students and staff through collaborative activities that fulfills technological

  demands.
- ✓ To nurture critical thinking, entrepreneurial skills and leadership qualities among future technocrats.
- ✓ To enhance proficiency for consultancy activities in assistance with Industry-Institute Interaction.

Program Educational Objectives (PEOs)

The following are the Program Educational Objectives (PEOs) of the UG programme of ECE Department and are established through IQAC and DAC

PEO 1: Basic Mathematics and Science- Strengthen the ability of the students with sound foundation in mathematical, scientific and engineering fundamentals necessary to formulate, solve and analyze the engineering problems and develop the solutions for real world problems.

PEO 2: Employability and Higher Studies- Impart the students with good scientific and engineering breadth by providing inter disciplinary courses for employability and higher studies so as to comprehend, analyze, design, create the product and simulate the real world entity.

PEO 3: Ethics-Inculcate professional and ethical attitude in students by providing effective communications Skill, leadership skills and team work to challenge the contemporary issues to broader social context.

PEO 4: To Become an Entrepreneur-Prepare the students for a successful career by meeting ever increasing demands required by Electronics and communication profession and enable them to become an entrepreneur.

PEO 5: Lifelong Learning-Creating an excellent academic learning environment by providing awareness on lifelong learning, written ethical code and guidelines need for successful professional career.

Programme Outcomes of the curriculum(POs)

PO1.	Graduates will have sound foundation in the mathematical, scientific and **Engineering Fundamentals** necessary to formulate, solve and analyze engineering problems.
PO2	Graduates will have the **Potential to Analyze**; create the program by solving the mathematical abstraction.
PO3.	Graduates will enable to **Design and Stimulate** the real time system.
PO4.	Graduates will have sound knowledge on analog and digital circuits, its functional units and modeling **Complex Engineering Problem.**
PO5.	Graduates will have knowledge and ability to use **Modern tools** during the usage of systems.
PO6.	Graduates will be able to qualify, verify and validate the system developed for the end-user which in turn for **Society**.
PO7.	Enhance the impact of engineering solutions for the need of social, E**nvironmental Contents for Sustainable** developments.
PO8.	Graduates will have ability to make the proper decision making in an **Ethical Manner** for the production of right product.
PO9.	Graduates will demonstrate an ability to function as an **Individual** and part of **Multi-disciplinary Teams.**
PO10.	Graduates will have the potential to improve the soft skills for global interaction through **Communication skill.**
PO11.	Apply engineering and **Management** principles for the **Development of Projects**.
PO12.	Graduates will be able to understand the impact of engineering solution on the society and with involvement of **Life-Long Learning** under the context of contemporary issues.

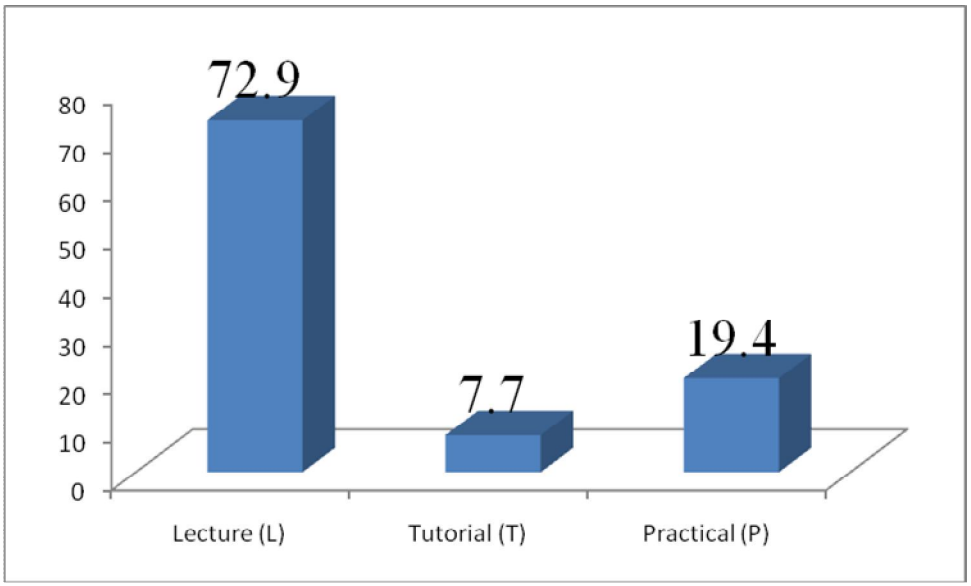
Curriculum Structure
R-2013

Course Code	Course Title	Total Number of contact hours				Credits
		Lecture (L)	Tutorial (T)	Practical (P)	Total Hours	
Science and Humanities						
HS2111	Technical English–I	45	15	0	60	4
MA2111	Mathematics–I	45	15	0	60	4
PH2111	Engineering Physics-I	45	15	0	60	3
CY2111	Engineering Chemistry-I	45	15	0	60	3
GE2111	Engineering Graphics	30	45	0	75	5
GE6151	Computer Programming	45	0	0	45	3
GE2115	Computer Practice Laboratory-I	0	0	45	45	2
GE2116	Engineering Practices Laboratory	0	0	45	45	2
GS2165	Physics &Chemistry Laboratory I	0	0	45	45	-
HS2161	Technical English – II	45	15	0	60	4
MA2161	Mathematics – II	45	15	0	60	4
PH2161	Engineering Physics – II	45	0	0	45	3
CY2161	Engineering Chemistry – II	45	0	0	45	3
EC6201	Electronic Devices	45	15	0	60	4
EE6201	Circuit Theory	60	0	0	60	4
GS2165	Physics and Chemistry Laboratory – II	0	0	45	45	2
EC6211	Circuits and Devices Laboratory	0	0	45	45	2
DC (Departmental Core)						
MA6351	Transforms and Partial Differential Equations	45	15	0	60	4
EE6352	Electrical Engineering and Instrumentation	45	0	0	45	3
EC6301	Object Oriented Programming and Data structures	45	0	0	45	3
EC6302	Digital Electronics	45	15	0	60	4
EC6303	Signals and systems	45	15	0	60	4
EC6304	Electronic Circuits- I	45	15	0	60	4

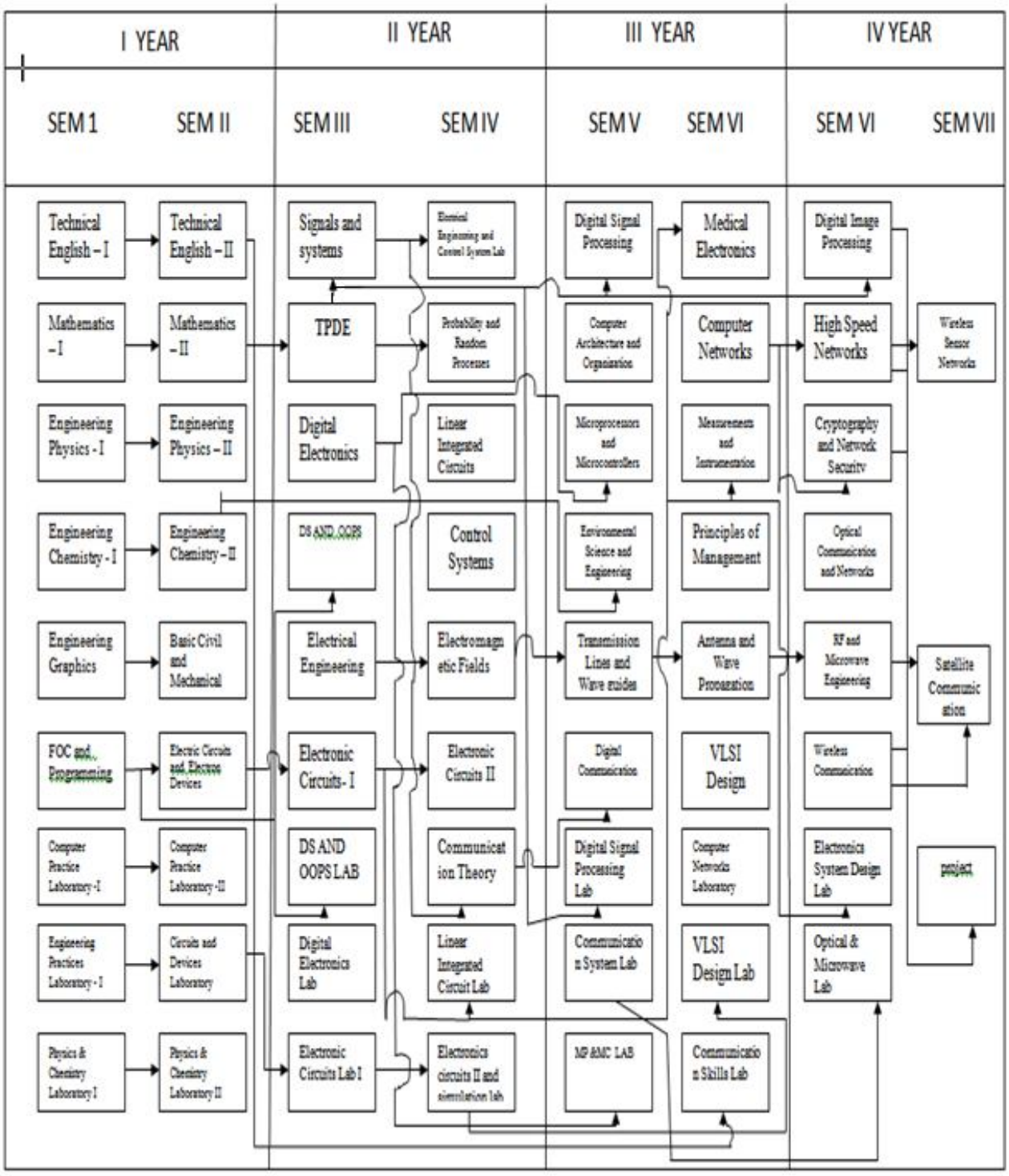
EC6311	Analog and Digital Circuits Laboratory	0	0	45	45	2
EC6312	OOPS and Data Structures Laboratory	0	0	45	45	2
MA6451	Probability and Random Processes	45	15	0	60	4
EC6401	Electronic Circuits II	45	15	0	60	4
EC6402	Communication Theory	45	15	0	60	4
EC6403	Electromagnetic Fields	45	15	0	60	4
EC6404	Linear Integrated Circuits	45	0	0	45	3
EC6405	Control Systems Engineering	45	0	0	45	3
EC6411	Circuit and Simulation Integrated Laboratory	0	0	45	45	2
EC6412	Linear Integrated Circuit Lab	0	0	45	45	2
EE6461	Electrical Engineering and Control System Lab	0	0	45	45	2
EC6501	Digital Communication	45	0	0	45	3
EC6502	Principles of Digital Signal Processing	45	15	0	60	4
EC6503	Transmission Lines and Wave guides	45	15	0	60	4
GE6351	Environmental Science and Engineering	45	0	0	45	3
EC6504	Microprocessors and Microcontrollers	45	15	0	60	4
EC6511	Digital Signal Processing Lab	0	0	45	45	2
EC6512	Communication System Lab	0	0	45	45	2
EC6513	Microprocessors and Microcontrollers Lab	0	0	45	45	2
MG6851	Principles of Management	45	0	0	45	3
CS6303	Computer Architecture	45	0	0	45	3
CS6551	Computer Networks	45	0	0	45	3
EC6602	Antenna and Wave Propagation	45	15	0	60	4
EC6601	VLSI Design	45	0	0	45	3
EC6611	Computer Networks Laboratory	0	0	45	45	2
EC6612	VLSI Design Lab	0	0	45	45	2
GE6674	Communication and Soft Skills - Laboratory	0	0	60	60	2
EC6703	Embedded and Real Time Systems	45	0	0	45	3

EC6702	Optical Communication and Networks	45	0	0	45	3
EC6701	RF and Microwave Engineering	45	0	0	45	3
EC6801	Wireless Communication	45	0	0	45	3
EC6802	Wireless Networks	45	0	0	45	3
EC6711	Embedded Laboratory	0	0	45	45	2
EC6712	Optical & Microwave Lab	**0**	**0**	**45**	45	2
DE (Departmental Elective)						
EC6001	Medical Electronics	45	0	0	45	3
CS6401	Operating Systems	45	0	0	45	3
EC6002	Advanced Digital Signal Processing	45	0	0	45	3
EC6003	Robotics and Automation	45	0	0	45	3
EC6004	Satellite Communication	45	0	0	45	3
EC6005	Electronic Testing	45	0	0	45	3
EC6006	Avionics	45	0	0	45	3
CS6012	Soft Computing	45	0	0	45	3
IT6005	Digital Image Processing	45	0	0	45	3
EC6007	Speech Processing	45	0	0	45	3
EC6008	Web Technology	45	0	0	45	3
EC6009	Advanced Computer Architecture	45	0	0	45	3
EC 6010	Electronics Packaging	45	0	0	45	3
EC6011	Electromagnetic Interference and Compatibility	45	0	0	45	3
EC6012	CMOS Analog IC Design	45	0	0	45	3
EC6013	Advanced Microprocessors and Microcontrollers	45	0	0	45	3
EC6014	Cognitive Radio	45	0	0	45	3
EC6015	Radar and Navigational Aids	45	0	0	45	3
EC 2029	Digital Image Processing	45	0	0	45	3
EC6016	Opto Electronic Devices	45	0	0	45	3
EC6017	RF System Design	45	0	0	45	3
CS6003	Ad hoc and Sensors Networks	45	0	0	45	3

EC6018	Multimedia Compression and Communication	45	0	0	45	3
EC6019	Data Converters	45	0	0	45	3
CS6701	Cryptography and Network Security	45	0	0	45	3
MG6071	Entrepreneurship Development	45	0	0	45	3
MG6088	Software Project Management	45	0	0	45	3
Humanities Social Sciences, Management (Elective) (HM)						
GE6757	Total Quality Management	45	0	0	45	3
GE6082	Indian Constitution and Society	45	0	0	45	3
GE6075	Professional Ethics in Engineering	45	0	0	45	3
TOTAL		**3105**	**330**	**825**	**4260**	**261**



Prerequisite flow chart



Curriculum Content

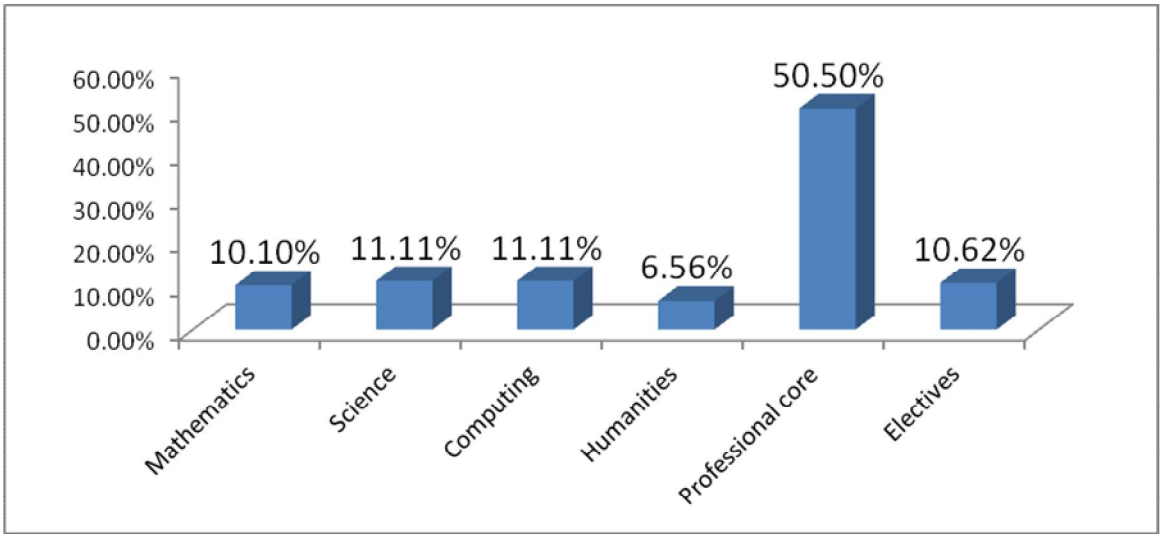
The programme curriculum satisfies the programme specific criteria

(i)The curriculum of the Electronics and Communication Engineering programme must provide adequate theoretical grounding in the non-linear and active electrical components such as semiconductor devices, especially transistors, diodes and integrated circuits are utilized to design electronic circuits, devices and systems, typically also including passive electrical components and based on printed circuit boards. The term denotes abroad Engineering field that covers important subfields such as Analog Electronics, Digital Electronics, Embedded Systems and Power Electronics. Electronics Engineering deals with implementation of applications, Principles and Algorithms developed within many related fields, for example Solid-State Physics, Radio Engineering, Telecommunications, Control Systems, Signal Processing, Systems Engineering, Computer Engineering, Instrumentation Engineering, Electric Power Control, Robotics and many other.

(ii) Faculty members conducting courses on ECE should have relevant educational qualifications and professional registration in ISTE/IETE /IEEE

Course Component	Curriculum Content (% of total number of credits of the programme)	Total number of contact hours	Total Number of credits	POs	PEOs
Mathematics	10.10%	300	20	1,2,3,4,12	1,2
Science	11.11%	330	22	1,2,3,7,12	1,2,3
Computing	11.11%	330	22	1,2,3,6	1,2,3
Humanities	6.56%	195	13	3,6,9,10,11,12	1,2,3,5
Professional core	50.5%	1500	100	1,2,3,4,5,6,7,8,9,10,11,12	1,2,3,4,5
Electives	10.62%	315	21	1,2,3,4,5,6,9,12	1,2,3,4,5
Total	100	2970	198		

Distribution Of Curriculum Under Different Components



HS6151 **TECHNICAL ENGLISH – I** **L T P C**
3 1 0 4

<table>
<tr><td>COURSE OBJECTIVES:</td><td colspan="13">1. To help students develop listening skills for academic and professional purposes.
2. To help students acquire the ability to speak effectively in English in real life situations.
3. To inculcate reading habit and to develop effective reading skills.
4. To help students improve their active and passive vocabulary.
5. To familiarize students with different rhetorical functions of scientific English.
6. To enable students write letters and reports effectively in formal and business situations.</td></tr>
<tr><td rowspan="5">COURSE OUTCOMES</td><td>CO1</td><td colspan="12">Understand basic grammar principles, interpret charts and write descriptions</td></tr>
<tr><td>CO2</td><td colspan="12">Listen, take notes and write clear and coherent passages</td></tr>
<tr><td>CO3</td><td colspan="12">Comprehend the different reading skills and develop strategies for understanding comprehension passages, using appropriate tense</td></tr>
<tr><td>CO4</td><td colspan="12">Speak through role plays and will have proficiency to use English in real life situation</td></tr>
<tr><td>CO5</td><td colspan="12">Analyze the need for effective communication and able to write business letters ,personal letters, paragraph writing etc</td></tr>
<tr><td rowspan="7">CO – PO MAPPING</td><td rowspan="2">COURSE OUTCOMES</td><td colspan="12">PROGRAM OUTCOME</td></tr>
<tr><td>1</td><td>2</td><td>3</td><td>4</td><td>5</td><td>6</td><td>7</td><td>8</td><td>9</td><td>10</td><td>11</td><td>12</td></tr>
<tr><td>CO1</td><td>3</td><td>3</td><td>2</td><td>3</td><td></td><td>2</td><td></td><td></td><td>1</td><td>3</td><td>3</td><td>3</td></tr>
<tr><td>CO2</td><td>1</td><td>3</td><td>1</td><td>2</td><td></td><td>2</td><td></td><td></td><td>2</td><td>3</td><td>1</td><td>3</td></tr>
<tr><td>CO3</td><td>2</td><td>3</td><td>2</td><td>1</td><td></td><td>1</td><td></td><td></td><td>1</td><td>3</td><td>3</td><td>3</td></tr>
<tr><td>CO4</td><td>1</td><td>1</td><td>1</td><td>1</td><td></td><td>1</td><td></td><td></td><td>3</td><td>1</td><td>3</td><td>1</td></tr>
<tr><td>CO5</td><td>1</td><td>1</td><td>3</td><td>1</td><td></td><td>2</td><td></td><td></td><td>1</td><td>1</td><td>2</td><td>3</td></tr>
</table>

UNIT I **9+3**

Listening - Introducing learners to GIE - Types of listening - Listening to audio (verbal & sounds); Speaking - Speaking about one‟s place, important festivals etc. – Introducing oneself, one‟s family / friend; Reading - Skimming a reading passage – Scanning for specific information - Note-making; Writing - Free writing on any given topic (My favourite place / Hobbies / School life, etc.) - Sentence completion - Autobiographical writing (writing about one‟s leisure time activities, hometown, etc.); Grammar - Prepositions - Reference words - Wh-questions - Tenses (Simple); Vocabulary - Word formation - Word expansion (root words / etymology); E-materials - Interactive exercises for Grammar & Vocabulary - Reading comprehension exercises - Listening to audio files and answering questions.

UNIT II **9+3**

Listening - Listening and responding to video lectures / talks; Speaking - Describing a simple process (filling a form, etc.) - Asking and answering questions - Telephone skills – Telephone etiquette; Reading – Critical reading - Finding key information in a given text - Sifting facts from opinions; Writing - Biographical writing (place, people) - Process descriptions (general/specific) - Definitions - Recommendations – Instructions; Grammar - Use of imperatives - Subject-verb agreement; Vocabulary - Compound words - Word Association (connotation); E-materials - Interactive exercises for Grammar and Vocabulary - Listening exercises with sample telephone conversations / lectures – Picture-based activities.

UNIT III **9+3**

Listening - Listening to specific task - focused audio tracks; Speaking - Role-play – Simulation - Group interaction - Speaking in formal situations (teachers, officials, foreigners); Reading - Reading and interpreting visual material; Writing - Jumbled sentences - Coherence and cohesion in writing - Channel conversion (flowchart into process) - Types of paragraph (cause and effect / compare and contrast / narrative / analytical) - Informal writing (letter/e-mail/blogs) - Paraphrasing; Grammar - Tenses (Past) - Use of sequence words - Adjectives; Vocabulary - Different forms and uses of words, Cause and effect words; E-materials - Interactive exercises for Grammar and Vocabulary - Excerpts from films related to the theme and follow up exercises - Pictures of flow charts and tables for interpretations.

UNIT IV **9+3**

Listening - Watching videos / documentaries and responding to questions based on them; Speaking - Responding to questions - Different forms of interviews - Speaking at different types of interviews; Reading - Making inference from the reading passage - Predicting the content of a reading passage; Writing - Interpreting visual materials (line graphs, pie charts etc.) - Essay writing – Different types of essays; Grammar - Adverbs – Tenses – future time reference; Vocabulary - Single word substitutes - Use of abbreviations and acronyms; E-materials - Interactive exercises for Grammar and Vocabulary - Sample interviews - film scenes - dialogue writing.

UNIT V **9+3**

Listening - Listening to different accents, Listening to Speeches/Presentations, Listening to broadcast and telecast from Radio and TV; Speaking - Giving impromptu talks, Making presentations on given topics; Reading - Email communication - Reading the attachment files having a poem/joke/proverb - Sending their responses through email; Writing - Creative writing, Poster making; Grammar - Direct and indirect speech; Vocabulary - Lexical items (fixed / semi fixed expressions); E-materials - Interactive exercises for Grammar and Vocabulary - Sending emails with attachment – Audio / video excerpts of different accents - Interpreting posters.

TOTAL (L:45+T:15): 60 PERIODS

Content beyond Syllabus:	Structure-sentence ,CV writing
Text Books	1.Department of Humanities & Social Sciences, Anna University, 'English for Engineers and Technologists' Combined Edition (Volumes 1 & 2), Chennai: Orient Longman Pvt. Ltd., 2006. Themes 1 – 4 (Resources,Energy, Computer, Transport)
Reference Books	1.Meenakshi Raman and Sangeeta Sharma, 'Technical Communication English skills for Engineers', Oxford University Press, 2008. 2.Andrea, J. Rutherford, 'Basic Communication Skills for Technology', Second Edition, Pearson Education, 2007.
Website:	www.nptel.iitm.ac.in ocw.mit.edu
ONLINE RESOURCES	PPT Presentation Online Objective Questions Videos Materials if any (You tube)

MA6151 **MATHEMATICS – I** **L T P C**
3 1 0 4

COURSE OBJECTIVES:	1. To equip students with adequate knowledge of mathematics that will enable them in formulating problems and solving problems analytically. 2. The course intends to provide an overview of infinite series which occur in problems of signal transmission, chemical diffusion, vibration and heat flow etc. 3. This course helps in translating a physical or other problem in to a mathematical model. 4. To provide an overview of discovering the experimental aspect of modern applied mathematics. 5. This course creates the ability to model, solve and interpret any physical or engineering problem	
COURSE OUTCOMES	CO1	Develop the use of matrix algebra techniques this is needed by engineers for practical applications.
	CO2	Analyze specific skills, competencies, and thought processes sufficient to support further study or work in this field or related fields, to demonstrate factual knowledge including the mathematical notation and terminology
	CO3	Familiarize the student with functions of several variables. This is needed in many branches of engineering.
	CO4	Understand the concepts of improper integrals, Gamma, Beta and Error functions which are needed in engineering applications
	CO5	Implement the student with mathematical tools needed in evaluating multiple integrals and their usage.

CO– PO MAPPING	COURSE OUTCOMES	PROGRAM OUTCOME											
		1	2	3	4	5	6	7	8	9	10	11	12
	CO1	3	2	2	1								
	CO2	2	3	2	1								
	CO3	2	2	1	2								
	CO4	3	3	2									
	CO5	2	2		1								

UNIT I MATRICES **9+3**

Eigen values and Eigenvectors of a real matrix – Characteristic equation – Properties of eigenvalues and eigenvectors – Statement and applications of Cayley-Hamilton Theorem – Diagonalization of matrices – Reduction of a quadratic form to canonical form by orthogonal transformation – Nature of quadratic forms.

UNIT II SEQUENCES AND SERIES **9+3**

Sequences: Definition and examples – Series: Types and Convergence – Series of positive terms – Tests of convergence: Comparison test, Integral test and D"Alembert"s ratio test – Alternating series – Leibnitz"s test – Series of positive and negative terms – Absolute and conditional convergence.

UNIT III APPLICATIONS OF DIFFERENTIAL CALCULUS 9+3

Curvature in Cartesian co-ordinates – Centre and radius of curvature – Circle of curvature – Evolutes – Envelopes - Evolute as envelope of normals.

UNIT IV DIFFERENTIAL CALCULUS OF SEVERAL VARIABLES 9+3

Limits and Continuity – Partial derivatives – Total derivative – Differentiation of implicit functions – Jacobian and properties – Taylor‟s series for functions of two variables – Maxima and minima of functions of two variables – Lagrange‟s method of undetermined multipliers.

UNIT V MULTIPLE INTEGRALS 9+3

Double integrals in cartesian and polar coordinates – Change of order of integration – Area enclosed by plane curves – Change of variables in double integrals – Area of a curved surface - Triple integrals – Volume of Solids.

TOTAL (L:45+T:15): 60 PERIODS

Content beyond Syllabus:	Vector spaces-linear dependence-linearly independent vectors-Dimension of a vector space-Inner product of vector space-orthogonal vectors-Norm of a vector-Gram-Schmidt orthoganalization process
Text Books	1. Bali N. P and Manish Goyal, “A Text book of Engineering Mathematics”, Eighth Edition, Laxmi Publications Pvt Ltd., (2011). 2. Grewal. B.S, “Higher Engineering Mathematics”, 41st Edition, Khanna Publications, Delhi, (2011).and company, Ltd., New Delhi, 2005
Reference Books	1. Dass, H.K., and Er. Rajnish Verma,” Higher Engineering Mathematics”, S. Chand Private Ltd., (2011). 2. Glyn James, “Advanced Modern Engineering Mathematics”, 3 rd Edition, Pearson Education, (2012). 3. Peter V. O’Neil,” Advanced Engineering Mathematics”, 7th Edition, Cengage learning, (2012). 4. Ramana B.V, “Higher Engineering Mathematics”, Tata McGraw Hill Publishing 5. Company, New Delhi, (2008).
Website:	This course uses exclusively for providing electronic resource, such as lecturer notes, assignment papers, and sample solutions. Students should make appropriate use of this recourse. http://teachers.sduhsd.k12.ca.us/abrown/index2.html http://mathforum.org http://nrich.maths.org http://archives.math.utk.edu/ http://www-groups.dcs.st-and.ac.uk/~history/
ONLINE RESOURCES	1. NPTEL Tutorials(Internal Server) 2. PPT Presentation 3. Online Objective Questions 4. Videos Materials if any (You tube)

PH6151 **ENGINEERING PHYSICS – I** **L T P C**
3 0 0 3

COURSE OBJECTIVES:	• To provide a broad foundation in the basics of science and engineering. • To provide sensible preparation for other areas of engineering, including mechanical, electrical, civil engineering and computer science. • To combine with problem solving and engineering skills, this then has based applications. • To help the students field of applied science and engineering concerned with design and application of physics.												
COURSE OUTCOMES	CO1	Choose fundamental knowledge in various engineering subjects and applications.											
	CO2	Categorize the laser technology.											
	CO3	Develop the laser knowledge in fibre optics											
	CO4	Apply the concepts of quantum mechanics to quantitatively predict behavior of physical systems											
	CO5	Analyze the crystal knowledge of in various materials and the internal structure of the materials											
CO – PO MAPPING	COURSE OUTCOMES	PROGRAM OUTCOME											
		1	2	3	4	5	6	7	8	9	10	11	12
	CO1	1				3							
	CO2	1		2		3	3						
	CO3	1				3	3						
	CO4	1	1										
	CO5	1	1		3								

UNIT I CRYSTAL PHYSICS **9**

Lattice – Unit cell – Bravais lattice – Lattice planes – Miller indices – d spacing in cubic lattice – Calculation of number of atoms per unit cell – Atomic radius – Coordination number – Packing factor for SC, BCC, FCC and HCP structures – Diamond and graphite structures (qualitative treatment)-Crystal growth techniques –solution, melt (Bridgman and Czochralski) and vapour growth techniques (qualitative)

UNIT II PROPERTIES OF MATTER AND THERMAL PHYSICS **9**

Elasticity- Hooke‟s law - Relationship between three modulii of elasticity (qualitative) – stress -strain diagram – Poisson‟s ratio –Factors affecting elasticity –Bending moment – Depression of a cantilever

–Young‟s modulus by uniform bending- I-shaped girders

Modes of heat transfer- thermal conductivity- Newton‟s law of cooling - Linear heat flow – Lee‟s disc method – Radial heat flow – Rubber tube method – conduction through compound media (series and parallel)

UNIT III QUANTUM PHYSICS **9**

Black body radiation – Planck‟s theory (derivation) – Deduction of Wien‟s displacement law and

Rayleigh – Jeans‟ Law from Planck‟s theory – Compton effect. Theory and experimental verification – Properties of Matter waves – G.P Thomson experiment -Schrödinger‟s wave equation – Time independent and time dependent equations – Physical significance of wave function – Particle in a one dimensional box - Electron microscope - Scanning electron microscope - Transmission electron microscope.

UNIT IVACOUSTICS AND ULTRASONICS **9**

Classification of Sound- decibel- Weber–Fechner law – Sabine‟s formula- derivation using growth and decay method – Absorption Coefficient and its determination –factors affecting acoustics of buildings and their remedies.

Production of ultrasonics by magnetostriction and piezoelectric methods - acoustic grating -Non Destructive Testing – pulse echo system through transmission and reflection modes - A,B and C – scan displays, Medical applications - Sonogram

UNIT V PHOTONICS AND FIBRE OPTICS **9**

Spontaneous and stimulated emission- Population inversion -Einstein‟s A and B coefficients - derivation. Types of lasers – Nd:YAG, CO_2 , Semiconductor lasers (homojunction & heterojunction)-
Industrial and Medical Applications.

Principle and propagation of light in optical fibres – Numerical aperture and Acceptance angle - Types of optical fibres (material, refractive index, mode) – attenuation, dispersion, bending - Fibre Optical Communication system (Block diagram) - Active and passive fibre sensors- Endoscope.

Content beyond Syllabus:	Principle of Spontaneous emission and stimulated emission. Population inversion
Text Books	1. 1. R. K. Gaur and S.C. Gupta, 'Engineering Physics' Dhanpat Rai Publications, New Delhi (2003). 2. M.N. Avadhanulu and PG Kshirsagar, 'A Text book of Engineering Physics', S.Chand and company, Ltd., New Delhi, 2005
Reference Books	1. Serway and Jewett, 'Physics for Scientists and Engineers with Modern Physics', 6th Edition, Thomson Brooks/Cole, Indian reprint (2007) 2. Rajendran, V and Marikani A, 'Engineering Physics' Tata McGraw Hill Publications Ltd, III Edition, New Delhi, (2004). 3. Palanisamy, P.K., 'Engineering Physics' Scitech publications, Chennai, (2007). 4. Jayakumar. S, 'Engineering Physics', R.K. Publishers, Coimbatore, (2003). 5. Chitra Shadrach and Sivakumar Vadivelu, 'Engineering Physics', Pearson Education,
Website:	1. http://www.hyperphysics.com 2. http: //www. physics.com 3. http://www.physicsclassroom.com/ 4. http://physics.nist.gov/
ONLINE RESOURCES	1. NPTEL Tutorials(Internal Server) 2. PPT Presentation 3. Online Objective Questions 4. Videos Materials if any (You tube)

CY6151 **ENGINEERING CHEMISTRY - I** **L T P C**
3 0 0 3

COURSE OBJECTIVES:	1.The student should be conversant with the water characterization and treatment of potable and industrial purposes. 2.To know various polymers and its engineering applications 3.To know the principle of surface chemistry and its engineering applications 4.To understand the type of conventional and non-conventional energy sources and to understand the principle and mechanism of various energy storage devices 5.To know chemistry involved in engineering materials and to understand their applications to engineering industry												
COURSE OUTCOMES	CO1	Understand and solve the various boiler troubles and water treatment methods											
	CO2	Evaluate the importance and significance of different types of polymers and composites in engineering applications.											
	CO3	Apply the knowledge about the principles, types of absorption and adsorption. Study about the industrial applications of surface chemistry											
	CO4	Explain the principles and generation of energy from batteries, solar cells, wind mills and fuel cells.											
	CO5	Acquire the knowledge about the engineering materials like cement, glass materials for the future industrial develop											
CO – PO MAPPING	COURSE OUTCOMES	PROGRAM OUTCOME											
		1	2	3	4	5	6	7	8	9	10	11	12
	CO1	3	2										
	CO2	2	1										
	CO3	2											
	CO4	2											
	CO5	3											

UNIT I POLYMER CHEMISTRY 9

Introduction: Classification of polymers – Natural and synthetic; Thermoplastic and Thermosetting. Functionality – Degree of polymerization. Types and mechanism of polymerization: Addition (Free Radical, cationic and anionic); condensation and copolymerization. Properties of polymers: Tg, Tacticity, Molecular weight – weight average, number average and polydispersity index. Techniques of polymerization: Bulk, emulsion, solution and suspension. Preparation, properties and uses of Nylon 6,6, and Epoxy resin.

UNIT II CHEMICAL THERMODYNAMICS 9

Terminology of thermodynamics - Second law: Entropy - entropy change for an ideal gas, reversible and irreversible processes; entropy of phase transitions; Clausius inequality. Free energy and work function: Helmholtz and Gibbs free energy functions (problems); Criteria of spontaneity; Gibbs-Helmholtz equation (problems); Clausius-Clapeyron equation; Maxwell relations – Van‟t Hoff isotherm and isochore(problems).

UNIT III PHOTOCHEMISTRY AND SPECTROSCOPY 9

Photochemistry: Laws of photochemistry - Grotthuss–Draper law, Stark–Einstein law and Lambert-Beer Law. Quantum efficiency – determination- Photo processes - Internal Conversion, Inter-system crossing, Fluorescence, Phosphorescence, Chemiluminescence and Photo-sensitization. Spectroscopy: Electromagnetic spectrum - Absorption of radiation – Electronic, Vibrational and rotational transitions. UV-visible and IR spectroscopy – principles, instrumentation (Block diagram only).

UNIT IV PHASE RULE AND ALLOYS 9

Phase rule: Introduction, definition of terms with examples, One Component System- water system - Reduced phase rule - Two Component Systems- classification – lead-silver system, zinc-magnesium system. Alloys: Introduction- Definition- Properties of alloys- Significance of alloying, Functions and effect of alloying elements- Ferrous alloys- Nichrome and Stainless steel – heat treatment of steel; Non-ferrous alloys – brass and bronze.

UNIT V NANOCHEMISTRY 9

Basics - distinction between molecules, nanoparticles and bulk materials; size-dependent properties. nanoparticles: nano cluster, nano rod, nanotube(CNT) and nanowire. Synthesis: precipitation, thermolysis, hydrothermal, solvothermal, electrodeposition, chemical vapour deposition, laser ablation; Properties and applications

TOTAL :45 PERIODS

Content beyond Syllabus:	1. The Institution arranges for guest lectures on recent developments in the field of engineering chemistry. 2. Audio visual equipments are used extensively so as to enhance learning interest.
Text Books	1. Jain P.C. and Monica Jain, Engineering Chemistry‖, Dhanpat Rai Publishing Company (P) Ltd., New Delhi, 2010 2. Kannan P., Ravikrishnan A, Engineering Chemistry‖, Sri Krishna Hi-tech Publishing Company Pvt. Ltd. Chennai, 2009
Reference Books	1. Dara S.S, Umare S.S, Engineering Chemistry, S. Chand & Company Ltd., New Delhi 2010 2. Sivasankar B.,Engineering Chemistry, Tata McGraw-Hill Publishing Company, Ltd., New Delhi, 2008. 3. Gowariker V.R. , Viswanathan N.V. and Jayadev Sreedhar, Polymer Science, New AgeInternational P (Ltd.,), Chennai, 2006. 4. Ozin G. A. and Arsenault A. C.,Nanochemistry: A Chemical Approach to Nanomaterials, RSC Publishing, 2005.
Website:	1. http://chemistry.about.com www.nptel.iitm.ac.in ocw.mit.edu
ONLINE RESOURCES	Online lecture notes on Thermodynamics, Polymers, spectroscopy, phase rule and etc

L T P C

GE6151 COMPUTER PROGRAMMING

3 0 0 3

PREREQUISITE:	Basic computer												
COURSE OBJECTIVES:	1To enable the student to learn the major components of a computer system 2To know the correct and efficient ways of solving problems 3To learn to use office automation tools 4To learn to program in C												
COURSE OUTCOMES	CO1	understand the basic computer organization											
	CO2	able to correct and solve the errors in programs											
	CO3	Understand about Object oriented programming.											
	CO4	Explain the Virtual functions, polymorphism and File Handling.											
	CO5	Formulate the algorithm for Stacks and queues.											
CO – PO MAPPING	COURSE OUTCOMES	PROGRAM OUTCOME											
		1	2	3	4	5	6	7	8	9	10	11	12
	CO1	3	2										
	CO2		3	2									
	CO3	2											
	CO4			2									
	CO5		3										

UNIT I INTRODUCTION 8

Generation and Classification of Computers- Basic Organization of a Computer –Number System – Binary – Decimal – Conversion – Problems. Need for logical analysis and thinking – Algorithm – Pseudo code – Flow Chart.

UNIT II C PROGRAMMING BASICS 10

Problem formulation – Problem Solving - Introduction to „ C‟ programming –fundamentals – structure of a „C‟ program – compilation and linking processes – Constants, Variables – Data Types – Expressions using operators in „C‟ – Managing Input and Output operations – Decision Making and Branching – Looping statements – solving simple scientific and statistical problems.

UNIT III ARRAYS AND STRINGS 9

Arrays – Initialization – Declaration – One dimensional and Two dimensional arrays. String- String operations – String Arrays. Simple programs- sorting- searching – matrix operations.

UNIT IV FUNCTIONS AND POINTERS 9

Function – definition of function – Declaration of function – Pass by value – Pass by reference – Recursion – Pointers - Definition – Initialization – Pointers arithmetic – Pointers and arrays- Example Problems.

UNIT V STRUCTURES AND UNIONS 9

Introduction – need for structure data type – structure definition – Structure declaration – Structure within a structure - Union - Programs using structures and Unions – Storage classes, Pre-processor directives.

TOTAL: 45 PERIODS

Content beyond Syllabus:	1.Decision Making 2.Number Systems
Text Books	1 Ashok.N.Kamthane," Computer Programming", Pearson Education (India) (2008). 2.Behrouz A.Forouzan and Richard.F.Gilberg, "A Structured Programming Approach Using C", II Edition, Brooks-Cole Thomson Learning Publications, (2007).
Reference Books	1Pradip Dey, Manas Ghoush, "Programming in C", Oxford University Press. (2007). 2Byron Gottfried, "Programming with C", 2nd Edition, (Indian Adapted Edition), TMH publications, (2006). 3Stephen G.Kochan, "Programming in C", Third Edition, Pearson Education India, (2005). 4Brian W.Kernighan and Dennis M.Ritchie, "The C Programming Language", Pearson Education Inc., (2005). 5E.Balagurusamy, "Computing fundamentals and C Programming", Tata McGraw-Hill Publishing Company Limited, (2008). 6.S.Thamarai Selvi and R.Murugan, "C for All", Anuradha Publishers, (2008).
Website:	www.nptel.iitm.ac.in ocw.mit.edu
ONLINE RESOURCES	NPTEL Tutorials(Internal Server) PPT Presentation Online Objective Questions Videos Materials if any (You tube)

GE6152 **ENGINEERING GRAPHICS** **L T P C**

2 0 3 4

PREREQUISITE:	Basic Trigonometry												
COURSE OBJECTIVES:	1. To develop in students graphic skill for communication of concepts, ideas and design of engineering products and expose them to existing national standards related to technical drawings												
COURSE OUTCOMES	CO1	understand the graphics skills for communication of concepts ideas and design of engineering products											
	CO2	knowledge on various projection methods											
	CO3	knowledge on existing national standards related to technical drawings											
	CO4	Knowledge about various drawing methods											
	CO5	Evaluate the engineering products											
CO – PO MAPPING	COURSE OUTCOMES	PROGRAM OUTCOME											
		1	2	3	4	5	6	7	8	9	10	11	12
	CO1	1	2	2	2				2				
	CO2	3	2	2	1			2					
	CO3	2	2	3	1			2					
	CO4	3	1	2									
	CO5		3	2									

UNIT I PLANE CURVES AND FREE HAND SKETCHING 5+9

Basic Geometrical constructions, Curves used in engineering practices: Conics – Construction of ellipse, parabola and hyperbola by eccentricity method – Construction of cycloid – construction of involutes of square and circle – Drawing of tangents and normal to the above curves, Scales: Construction of Diagonal and Vernier scales.

Visualization concepts and Free Hand sketching: Visualization principles –Representation of Three Dimensional objects – Layout of views- Free hand sketching of multiple views from pictorial views of objects

UNIT II PROJECTION OF POINTS, LINES AND PLANE SURFACES 5+ 9

Orthographic projection- principles-Principal planes-First angle projection-projection of points. Projection of straight lines (only First angle projections) inclined to both the principal planes - Determination of true lengths and true inclinations by rotating line method and traces Projection of planes (polygonal and circular surfaces) inclined to both the principal planes by rotating object method.

UNIT III PROJECTION OF SOLIDS 5+9

Projection of simple solids like prisms, pyramids, cylinder, cone and truncated solids when the axis is inclined to one of the principal planes by rotating object method and auxiliary plane method.

UNIT IV PROJECTION OF SECTIONED SOLIDS AND DEVELOPMENT OF SURFACES 5+9

Sectioning of above solids in simple vertical position when the cutting plane is inclined to the one of the principal planes and perpendicular to the other – obtaining true shape of section . Development of lateral surfaces of simple and sectioned solids – Prisms, pyramids cylinders and cones. Development of lateral surfaces of solids with cut-outs and holes

UNIT V ISOMETRIC AND PERSPECTIVE PROJECTIONS 6+9

Principles of isometric projection – isometric scale –Isometric projections of simple solids and truncated solids - Prisms, pyramids, cylinders, cones- combination of two solid objects in simple vertical positions and miscellaneous problems. Perspective projection of simple solids-Prisms, pyramids and cylinders by visual ray method .

Content beyond Syllabus:	Representation of multi dimensional objects
Text Books	1. N.D. Bhatt, "Engineering Drawing" Charotar Publishing House, 46 (2003).
Reference Books	1. K. V. Natrajan, "A text book of Engineering Graphics", Dhanalakshmi Publishers, Chennai (2006). 2. M.S. Kumar, "Engineering Graphics", D.D. Publications, (2007). 3. K. Venugopal & V. Prabhu Raja, "Engineering Graphics", New Age International (P) Limited (2008). 4. M.B. Shah and B.C. Rana, "Engineering Drawing", Pearson Education (2005). 5. K. R. Gopalakrishnana, "Engineering Drawing" (Vol.I&II), Subhas Publications (1998). 6. Dhananjay A.Jolhe, "Engineering Drawing with an introduction to AutoCAD" Tata McGraw Hill Publishing Company Limited (2008). 7. Basant Agarwal and Agarwal C.M., "Engineering Drawing", Tata McGraw HillPublishing Company Limited, New Delhi, (2008).
ONLINE RESOURCES	• NPTEL TUTORIALS (Internal Server) • Online Objective Questions • Videos Materials if any (You tube)

GE6161 **COMPUTER PRACTICES LABORATORY** **L T P C**
0 0 3 2

PREREQUISITE:	Basic computer												
COURSE OBJECTIVES:	To enable the student to learn the major components of a computer system To know the correct and efficient ways of solving problems To learn to use office automation tools To learn to program in C												
COURSE OUTCOMES	CO1	Familiarize UNIX commands and shell programing											
	CO2	practical background ,the course emphasis in practical issues in UNIX											
	CO3	knowledge on C programming in UNIX											
	CO4	understand the basic internet usage											
	CO5	understand the basic concept of MS office											
CO – PO MAPPING	COURSE OUTCOMES	PROGRAM OUTCOME											
		1	2	3	4	5	6	7	8	9	10	11	12
	CO1	3	3										
	CO2		2										
	CO3	2		3									
	CO4												
	CO5			2									

LIST OF EXPERIMENTS:

1. Search, generate, manipulate data using MS office/ Open Office
2. Presentation and Visualization – graphs, charts, 2D, 3D
3. Problem formulation, Problem Solving and Flowcharts
4. C Programming using Simple statements and expressions
5. Scientific problem solving using decision making and looping.
6. Simple programming for one dimensional and two dimensional arrays.
7. Solving problems using String functions
8. Programs with user defined functions – Includes Parameter Passing
9. Program using Recursive Function and conversion from given program to flow chart.
10. Program using structures and unions.

TOTAL : 45 PERIODS

Content beyond Syllabus:	Descriptive writing, Creative and critical thinking
Text Books	1. Chapters 5 – 8. Department of Humanities & Social Sciences, Anna University, 'English for Engineers and Technologists' Combined Edition (Volumes 1 & 2), Chennai: Orient Longman Pvt. Ltd., 2006. Themes 5 – 8 (Technology, Communication, Environment, industry)
Reference Books	1. P. K. Dutt, G. Rajeevan and C.L.N Prakash, 'A Course in Communication Skills', Cambridge University Press, India 2007. 2. Krishna Mohan and Meera Banerjee, 'Developing Communication Skills', Macmillan India Ltd., (Reprinted 1994 – 2007). 3. Edgar Thorpe, Showick Thorpe, 'Objective English', Second Edition, Pearson Education, 2007.

Website:	www.nptel.iitm.ac.in ocw.mit.edu
ONLINE RESOURCES	PPT Presentation Online Objective Questions Videos Materials if any (You tube)

GE6162 ENGINEERING PRACTICES LABORATORY L T P C
0 0 3 2

COURSE OUTCOMES	CO1	exposure to various hands on works in basic engineering practice											
	CO2	know to handle the equipments safty with various accessories											
	CO3	basic knowledge in welding and sheet metal											
	CO4	Basic knowledge in electrical equipments											
	CO5	Basic knowledge in electronics components											
CO – PO MAPPING	COURSE OUTCOMES	PROGRAM OUTCOME											
		1	2	3	4	5	6	7	8	9	10	11	12
	CO1	3	2									1	
	CO2	1	2	1								2	
	CO3	3	2	2				1				1	
	CO4	3	2	2	1							1	
	CO5	3	2	2	1							1	

GROUP A (CIVIL & MECHANICAL)

I CIVIL ENGINEERING PRACTICE 9

Buildings:

(a) Study of plumbing and carpentry components of residential and industrial buildings. Safety aspects

Plumbing Works:

(a) Study of pipeline joints, its location and functions: valves, taps, couplings, unions, reducers, elbows in household fittings.
(b) Study of pipe connections requirements for pumps and turbines.
(c) Preparation of plumbing line sketches for water supply and sewage works.
(d) Hands-on-exercise:
Basic pipe connections – Mixed pipe material connection – Pipe connections with different joining components.
(e) Demonstration of plumbing requirements of high-rise buildings.

Carpentry using Power Tools only:

(a) Study of the joints in roofs, doors, windows and furniture.
(b) Hands-on-exercise:
Wood work, joints by sawing, planning and cutting.

II MECHANICAL ENGINEERING PRACTICE 13

Welding:

(a) Preparation of arc welding of butt joints, lap joints and tee joints.
(b) Gas welding practice

Basic Machining:

(a) Simple Turning and Taper turning
(b) Drilling Practice

Sheet Metal Work:

(a) Forming & Bending:
(b) Model making – Trays, funnels, etc.
(c) Different type of joints.

Machine assembly practice:

(a) Study of centrifugal pump
(b) Study of air conditioner

Demonstration on:

(a) Smithy operations, upsetting, swaging, setting down and bending. Example – Exercise – Production of hexagonal headed bolt.
(b) Foundry operations like mould preparation for gear and step cone pulley.
(c) Fitting – Exercises – Preparation of square fitting and vee – fitting models.

GROUP B (ELECTRICAL & ELECTRONICS)

III ELECTRICAL ENGINEERING PRACTICE 10

1. Residential house wiring using switches, fuse, indicator, lamp and energy meter.
2. Fluorescent lamp wiring.
3. Stair case wiring
4. Measurement of electrical quantities – voltage, current, power & power factor in RLC circuit.
5. Measurement of energy using single phase energy meter.
6. Measurement of resistance to earth of an electrical equipment.

IVELECTRONICS ENGINEERING PRACTICE 13

1. Study of Electronic components and equipments – Resistor, colour coding measurement of AC signal parameter (peak-peak, rms period, frequency) using CR.
2. Study of logic gates AND, OR, EOR and NOT.
3. Generation of Clock Signal.
4. Soldering practice – Components Devices and Circuits – Using general purpose PCB.
5. Measurement of ripple factor of HWR and FWR.

TOTAL: 45 PERIODS

Content beyond Syllabus:	Principle of Spontaneous emission and stimulated emission. Population inversion
Text Books	1. 1. R. K. Gaur and S.C. Gupta, 'Engineering Physics' Dhanpat Rai Publications, New Delhi (2003). 2. M.N. Avadhanulu and PG Kshirsagar, 'A Text book of Engineering Physics', S.Chand and company, Ltd., New Delhi, 2005
Reference Books	1. Serway and Jewett, 'Physics for Scientists and Engineers with Modern Physics', 6th Edition, Thomson Brooks/Cole, Indian reprint (2007) 2. Rajendran, V and Marikani A, 'Engineering Physics' Tata McGraw Hill Publications Ltd, III Edition, New Delhi, (2004). 3. Palanisamy, P.K., 'Engineering Physics' Scitech publications, Chennai, (2007). 4. Jayakumar. S, 'Engineering Physics', R.K. Publishers, Coimbatore, (2003). 5. Chitra Shadrach and Sivakumar Vadivelu, 'Engineering Physics', Pearson Education,

Website:	1. http://www.hyperphysics.com 2. http: //www. physics.com 3. http://www.physicsclassroom.com/ 4. http://physics.nist.gov/
ONLINE RESOURCES	1. NPTEL Tutorials(Internal Server) 2. PPT Presentation 3. Online Objective Questions 4. Videos Materials if any (You tube)

GE6163 PHYSICS AND CHEMISTRY LABORATORY – I L T P C
0 0 2 1

PHYSICS LABORATORY – I

PREREQUISITE:	Engineering Physics -I	
COURSE OBJECTIVES:	• To design and conduct experiment, as well as to analyze and interpret data. • To get knowledge of contemporary analytical and experimental techniques	
COURSE OUTCOMES	CO1	Implement the optic knowledge in non-ideal elements, such as lasers and optics in experiments
	CO2	Develop the basic knowledge and find the Young's modulus of the material- non uniform bending
	CO3	Remember the basic physics experiments with the knowledge in mechanics and waves & oscillations
	CO4	Enumerate the basic quantities in electromagnetic emissions. A diffraction grating is used to identify specific wavelengths from the emission spectrum
	CO5	Apply the property of material ie the coefficient of thermal conductivity and determination of thermal conductivity for good conductor

CO – PO MAPPING

COURSE OUTCOMES	PROGRAM OUTCOME											
	1	2	3	4	5	6	7	8	9	10	11	12
CO1	1				3				1			
CO2	1					3			1			
CO3	1								1			
CO4	1								1			
CO5	1								1			

LIST OF EXPERIMENTS

(Any FIVE Experiments)

1 (a) Determination of Wavelength, and particle size using Laser
(b) Determination of acceptance angle in an optical fiber.
2. Determination of velocity of sound and compressibility of liquid – Ultrasonic interferometer.
3. Determination of wavelength of mercury spectrum – spectrometer grating
4. Determination of thermal conductivity of a bad conductor – Lee‟s Disc method.
5. Determination of Young‟s modulus by Non uniform bending method
6. Determination of specific resistance of a given coil of wire – Carey Foster‟s Bridge

CHEMISTRY LABORATORY-I

LIST OF EXPERIMENTS

(Any FIVE Experiments)

<table>
<tr><td>PREREQUISITE:</td><td colspan="14">Engineering Chemistry 1</td></tr>
<tr><td>COURSE OBJECTIVES:</td><td colspan="14">• To make students familiarize with the practical aspects of volumetric analysis of water samples and determine the parameters like DO and chlorides.
• To acquaint the students with the determination of molecular weight of a polymer by
• Viscometer.
• To improve the knowledge of different types of titrations used in volumetric analysis
• To make students develop in terms of practical skills required for analytical projects.
• To imbibe the advantages of instrumental methods of chemical analysis</td></tr>
<tr><td rowspan="5">COURSE OUTCOMES</td><td>CO1</td><td colspan="13">Analyze the parameters of DO and chlorides in water sample.</td></tr>
<tr><td>CO2</td><td colspan="13">Develop in terms of practical skills required for analytical projects and ability to conduct experiments and analyze the data and report results</td></tr>
<tr><td>CO3</td><td colspan="13">Acquire practical knowledge related to the concept of photochemical reactions</td></tr>
<tr><td>CO4</td><td colspan="13">Exhibit the skills in performing experiments based on the theoretical fundamentals available</td></tr>
<tr><td>CO5</td><td colspan="13">Acquaint the determination of molecular weight of a polymer by viscometer</td></tr>
<tr><td rowspan="6">CO – PO MAPPING</td><td rowspan="2">COURSE OUTCOMES</td><td colspan="13">PROGRAM OUTCOME</td></tr>
<tr><td>1</td><td>2</td><td>3</td><td>4</td><td>5</td><td>6</td><td>7</td><td>8</td><td>9</td><td>10</td><td>11</td><td>12</td></tr>
<tr><td>CO1</td><td>3</td><td>2</td><td></td><td>3</td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td></tr>
<tr><td>CO2</td><td>2</td><td>1</td><td></td><td>3</td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td></tr>
<tr><td>CO3</td><td>2</td><td></td><td></td><td>3</td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td></tr>
<tr><td>CO4</td><td>2</td><td></td><td></td><td>2</td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td></tr>
</table>

- Determination of DO content of water sample by Winkler‟s method.
- Determination of chloride content of water sample by argentometric method
- Determination of strength of given hydrochloric acid using pH meter
- Determination of strength of acids in a mixture using conductivity meter
- Estimation of iron content of the water sample using spectrophotometer (1,10-phenanthroline / thiocyanate method)
- Determination of molecular weight of polyvinylalcohol using Ostwald viscometer
- Conductometric titration of strong acid vs strong base

TOTAL: 30 PERIODS

HS6251 **TECHNICAL ENGLISH II** **LT P C**

PREREQUISITE:	Technical English I	
COURSE OBJECTIVES:	□ To help students develop listening skills for academic and professional purposes. □ To help students acquire the ability to speak effectively in English in real-life situations. □ To inculcate reading habit and to develop effective reading skills. □ To help students improve their active and passive vocabulary. □ To familiarize students with different rhetorical functions of scientific English. □ To enable students write letters and reports effectively in formal and business situations.	
COURSE OUTCOMES	CO1	Read different genres of texts, infer implied meanings and critically analysis and evaluate them for ideas as well as for method of presentation
	CO2	Listen/View and comprehend different spoken excerpts critically and infer unspoken and implied meanings
	CO3	Speak Convincingly express their opinions clearly, initiate a discussion, negotiate, argue using appropriate communicative strategies
	CO4	Write effectively and persuasively and produce different types of writing such as narration, description, exposition and argument as well as creative, critical, analytical and evaluative writing
	CO5	Write effective essays reports and proposals.

CO – PO MAPPING	COURSE OUTCOMES	PROGRAM OUTCOME											
		1	2	3	4	5	6	7	8	9	10	11	12
	CO1										3		
	CO2								2		3		
	CO3								2		3		
	CO4								2		3		
	CO5										3		

UNIT I **9+3**

Listening - Listening to informal conversations and participating; Speaking - Opening a conversation (greetings, comments on topics like weather) - Turn taking - Closing a conversation (excuses, general wish, positive comment, thanks); Reading - Developing analytical skills, Deductive and inductive reasoning - Extensive reading; Writing - Effective use of SMS for sending short notes and messages - Using „emoticons‟ as symbols in email messages; Grammar - Regular and irregular verbs - Active and passive voice; Vocabulary - Homonyms (e.g. „can‟) - Homophones (e.g. „some‟, „sum‟); E-materials - Interactive exercise on Grammar and vocabulary – blogging; Language Lab - Listening to different types of conversation and answering questions.

UNIT II **9+3**

Listening - Listening to situation based dialogues; Speaking - Conversation practice in real life situations, asking for directions (using polite expressions), giving directions (using imperative sentences), Purchasing goods from a shop, Discussing various aspects of a film (they have already seen) or a book (they have already read); Reading - Reading a short story or an article from newspaper, Critical reading, Comprehension skills; Writing - Writing a review / summary of a story / article, Personal letter (Inviting your friend to a function, congratulating someone for his / her success,

thanking one‟s friends / relatives); Grammar - modal verbs, Purpose expressions; Vocabulary - Phrasal verbs and their meanings, Using phrasal verbs in sentences; E-materials - Interactive exercises on Grammar and vocabulary, Extensive reading activity (reading stories / novels), Posting reviews in blogs - Language Lab - Dialogues (Fill up exercises), Recording students‟ dialogues.

UNIT III **9+3**

Listening - Listening to the conversation - Understanding the structure of conversations; Speaking - Conversation skills with a sense of stress, intonation, pronunciation and meaning - Seeking information – expressing feelings (affection, anger, regret, etc.); Reading - Speed reading – reading passages with time limit - Skimming; Writing - Minutes of meeting – format and practice in the preparation of minutes - Writing summary after reading articles from journals - Format for journal articles – elements of technical articles (abstract, introduction, methodology, results, discussion, conclusion, appendices, references) - Writing strategies; Grammar - Conditional clauses - Cause and effect expressions; Vocabulary - Words used as nouns and verbs without any change in the spelling (e.g. „rock‟, „train‟, „ring‟); E-materials - Interactive exercise on Grammar and vocabulary - Speed Reading practice exercises; Language Lab - Intonation practice using EFLU and RIE materials
– Attending a meeting and writing minutes.

UNIT IV **9+3**

Listening - Listening to a telephone conversation, Viewing model interviews (face-to-face, telephonic and video conferencing); Speaking - Role play practice in telephone skills - listening and responding, -asking questions, - note taking – passing on messages, Role play and mock interview for grasping interview skills; Reading - Reading the job advertisements and the profile of the company concerned – scanning; Writing - Applying for a job – cover letter - résumé preparation – vision, mission and goals of the candidate; Grammar - Numerical expressions - Connectives (discourse markers); Vocabulary - Idioms and their meanings – using idioms in sentences; E-materials - Interactive exercises on Grammar and Vocabulary - Different forms of résumés- Filling up a résumé / cover letter; Language Lab - Telephonic interview – recording the responses - e-résumé writing.

UNIT V **9+3**

Listening - Viewing a model group discussion and reviewing the performance of each participant - Identifying the characteristics of a good listener; Speaking - Group discussion skills – initiating the discussion – exchanging suggestions and proposals – expressing dissent/agreement – assertiveness in expressing opinions – mind mapping technique; Reading - Note making skills – making notes from books, or any form of written materials - Intensive reading; Writing – Checklist - Types of reports – Feasibility / Project report – report format – recommendations / suggestions – interpretation of data (using charts for effective presentation); Grammar - Use of clauses; Vocabulary – Collocation; E-materials - Interactive grammar and vocabulary exercises - Sample GD - Pictures for discussion, Interactive grammar and vocabulary exercises; Language Lab - Different models of group discussion.

TOTAL (L:45+T:15): 60 PERIODS

Content beyond Syllabus:	Descriptive writing, Creative and critical thinking
Text Books	2. Chapters 5 – 8. Department of Humanities & Social Sciences, Anna University, 'English for Engineers and Technologists' Combined Edition (Volumes 1 & 2), Chennai: Orient Longman Pvt. Ltd., 2006. Themes 5 – 8 (Technology, Communication, Environment, industry)
Reference Books	1. P. K. Dutt, G. Rajeevan and C.L.N Prakash, 'A Course in Communication Skills', Cambridge University Press, India 2007. 2. Krishna Mohan and Meera Banerjee, 'Developing Communication Skills', Macmillan India Ltd., (Reprinted 1994 – 2007). 3. Edgar Thorpe, Showick Thorpe, 'Objective English', Second Edition, Pearson Education, 2007.

Website:	1.http://www.englishclub.com 2.http://owl.english.purdue.edu
ONLINE RESOURCES	PPT Presentation Online Objective Questions Videos Materials if any (You tube)

MA6251 MATHEMATICS – II LTPC 3104

PREREQUISITE:	**MATHEMATICS – I**												
COURSE OBJECTIVES:	To Know the basics of Differential and Integral Calculus, the meaning of limit, continuity and derivative of a single variable and their applications to engineering problems, the various methods of integration To solve simple ordinary differential equation of 1st and 2nd order, the concept of Vector Algebra To apply concepts of Vector Algebra to Statics, how to apply the concepts of Differential and Integral Calculus in solving the problems of Dynamics. To Understand their engineering application To solve related simple numerical problems this will help them to understand the subject												
COURSE OUTCOMES	CO1	Aware the student with the concepts of vector calculus needed for problems in all engineering disciplines and applications.											
	CO2	Understand the student acquire sound knowledge of techniques in solving ordinary differential equations that model engineering problems											
	CO3	Implement the student appreciate the purpose of using transforms to create a new domain in which it is easier to handle the problem that is being investigated.											
	CO4	Understand the standard techniques of analytic function so as to enable the student to apply them with confidence, in application areas such as heat conduction, elasticity, fluid dynamics and flow the of electric current.											
	CO5	Analyse the techniques of analytic function so as to enable the student to apply them with confidence, in application areas such as heat conduction, elasticity, fluid dynamics and flow the of electric current.											
CO – PO MAPPING	COURSE OUTCOMES	PROGRAM OUTCOME											
		1	2	3	4	5	6	7	8	9	10	11	12
	CO1	3											
	CO2	3	3							1			
	CO3	2	2							1			
	CO4	3	3							1			
	CO5	2	3							1			

UNIT I VECTOR CALCULUS 9+3

Gradient, divergence and curl – Directional derivative – Irrotational and solenoidal vector fields – Vector integration – Green‟s theorem in a plane, Gauss divergence theorem and Stokes‟ theorem (excluding proofs) – Simple applications involving cubes and rectangular parallelopipeds.

UNIT II ORDINARY DIFFERENTIAL EQUATIONS 9+3

Higher order linear differential equations with constant coefficients – Method of variation of parameters – Cauchy‟s and Legendre‟s linear equations – Simultaneous first order linear equations with constant coefficients.

UNIT III LAPLACE TRANSFORM 9+3

Laplace transform – Sufficient condition for existence – Transform of elementary functions – Basic properties – Transforms of derivatives and integrals of functions - Derivatives and integrals of transforms - Transforms of unit step function and impulse functions – Transform of periodic functions. Inverse Laplace transform -Statement of Convolution theorem – Initial and final value theorems – Solution of linear ODE of second order with constant coefficients using Laplace transformation techniques.

UNIT IV ANALYTIC FUNCTIONS 9+3

Functions of a complex variable – Analytic functions: Necessary conditions – Cauchy-Riemann equations and sufficient conditions (excluding proofs) – Harmonic and orthogonal properties of analytic function – Harmonic conjugate – Construction of analytic functions – Conformal mapping: $w = z+k$, kz, $1/z$, z^2, e^z and bilinear transformation.

UNIT V COMPLEX INTEGRATION 9+3

Complex integration – Statement and applications of Cauchy‟s integral theorem and Cauchy‟s integral formula – Taylor‟s and Laurent‟s series expansions – Singular points – Residues – Cauchy‟s residue theorem – Evaluation of real definite integrals as contour integrals around unit circle and semi-circle (excluding poles on the real axis).

TOTAL (L:45+T:15): 60 PERIODS

Content beyond Syllabus:	Fourier series
Text Books	1. Bali N. P and Manish Goyal, “Text book of Engineering Mathematics”, 3rdEdition, Laxmi Publications (p) Ltd., (2008). 2. Grewal. B.S, “Higher Engineering Mathematics”, 40th Edition, Khanna Publications, Delhi, (2007).
Reference Books	1 Ramana B.V, “Higher Engineering Mathematics”,Tata McGraw Hill Publishing Company, New Delhi, (2007). 2. Glyn James, “Advanced Engineering Mathematics”, 3rd Edition, Pearson Education, (2007). 3. Erwin Kreyszig, “Advanced Engineering Mathematics”, 7 th Edition, Wiley India, (2007). 4. Jain R.K and Iyengar S.R.K, “Advanced Engineering Mathematics”, 3rd Edition, Narosa Publishing House Pvt. Ltd., (2007).
Website:	http://www.delnet.nic.in/ http://hdl.handle.net/1944/1829 www.nptel.iitm.ac.in ocw.mit.edu
ONLINE RESOURCES	PPT Presentation Online Objective Questions Videos Materials if any (You tube)

PH6251 **ENGINEERING PHYSICS – II** **L T P C**

3 0 0 3

PREREQUISITE:	ENGINEERING PHYSICS - I												
COURSE OBJECTIVES:	• Students will be well equipped to pursue research and development careers in new and emerging technologies such as properties of new materials. • To gain the students for application of science in the design, construction, analysis of machines, processes or work for practical purposes.												
COURSE OUTCOMES	CO1	Explain the principles derived from Wiedemann – Franz law.											
	CO2	Choose the property of semiconductor materials by projecting the view of energy bands and in diodes.											
	CO3	Develop the knowledge of material in magnetism and application of different types of magnets in various disciplines.											
	CO4	Apply the knowledge of dielectrics materials in electrical phenomenon.											
	CO5	Interpret concepts of nano science technology in Engineering and nano tubes.											
CO – PO MAPPING	COURSE OUTCOMES	PROGRAM OUTCOME											
		1	2	3	4	5	6	7	8	9	10	11	12
	CO1	3	3							1			
	CO2	2											
	CO3	1											
	CO4	1											
	CO5	2											

UNIT I CONDUCTING MATERIALS 9

Conductors – classical free electron theory of metals – Electrical and thermal conductivity – Wiedemann – Franz law – Lorentz number – Draw backs of classical theory – Quantum theory – Fermi distribution function – Effect of temperature on Fermi Function – Density of energy states – carrier concentration in metals.

UNIT II SEMICONDUCTING MATERIALS 9

Intrinsic semiconductor – carrier concentration derivation – Fermi level – Variation of Fermi level with temperature – electrical conductivity – band gap determination – compound semiconductors -direct and indirect band gap- derivation of carrier concentration in n-type and p-type semiconductor – variation of Fermi level with temperature and impurity concentration — Hall effect –Determination of Hall coefficient – Applications.

UNIT III MAGNETIC AND SUPERCONDUCTING MATERIALS 9

Origin of magnetic moment – Bohr magneton – comparison of Dia, Para and Ferro magnetism – Domain theory – Hysteresis – soft and hard magnetic materials – antiferromagnetic materials – Ferrites and its applications

Superconductivity : properties – Type I and Type II superconductors – BCS theory of superconductivity(Qualitative) - High T_c superconductors – Applications of superconductors – SQUID, cryotron, magnetic levitation.

UNIT IV DIELECTRIC MATERIALS 9

Electrical susceptibility – dielectric constant – electronic, ionic, orientational and space charge polarization – frequency and temperature dependence of polarisation – internal field – Claussius – Mosotti relation (derivation) – dielectric loss – dielectric breakdown – uses of dielectric materials (capacitor and transformer) – ferroelectricity and applications.

UNIT VADVANCED ENGINEERING MATERIALS **9**

Metallic glasses: preparation, properties and applications. Shape memory alloys (SMA): Characteristics, properties of NiTi alloy, application, Nanomaterials– Preparation -pulsed laser deposition – chemical vapour deposition – Applications – NLO materials –Birefringence- optical Kerr effect – Classification of Biomaterials and its applications

TOTAL: 45 PERIODS

Content beyond Syllabus:	Variation of Fermi level with temperature
Text Books	1. Charles Kittel 'Introduction to Solid State Physics', John Wiley & sons, 7th edition, Singapore (2007) 2. Charles P. Poole and Frank J.Owen,'Introduction to Nanotechnology', Wiley India(2007) (for Unit V)
Reference Books	1 Rajendran, V, and Marikani A, 'Materials science'Tata McGraw Hill publications, (2004) New delhi. 2. Jayakumar, S. 'Materials science', R.K. Publishers, Coimbatore, (2008). 3. Palanisamy P.K, 'Materials science', Scitech publications(India) Pvt. LTd., Chennai,second Edition(2007) 4. M. Arumugam, 'Materials Science' Anuradha publications, Kumbakonam, (2006).
Website:	1. http://www.hyperphysics.com 2. http://www.sciencejoywagon.com/physicszone
ONLINE RESOURCES	PPT Presentation Online Objective Questions Videos Materials if any (You tube)

CY6251 **ENGINEERING CHEMISTRY-II** **L T P C**
3 0 0 3

PREREQUISITE:	ENGINEERING CHEMISTRY -I	
COURSE OBJECTIVES:	• The student should be conversant with the principles electrochemistry, • Electrochemical cells, emf and its applications. • To know the type of corrosion and principle and mechanism of corrosion on metals and alloys. Further to the about control mechanism on corrosion • To understand and type of fuel, calorific value and to know combustion calculations. • To know the principle of phase rule , phase diagram and heat treatment methods of alloys. • To understand various analytical methods and their industrial applications	
COURSE OUTCOMES	CO1	Demonstrate the construction and the working principle of electrochemistry, electrochemical cells and emf and applications of emf measurements.
	CO2	Explain the principles of corrosion control and types of corrosion in metal & alloys and their protection and solve the corrosion problem.

	CO3	Acquire the knowledge the manufacturing methods in chemistry of fuels and combustion and its chemical properties.											
	CO4	Evaluate the various component system of alloy material. Understand with industrial importance of phase rule and alloys.											
	CO5	Apply the knowledge the basic law's of UV-visible and IR spectroscopy.											
CO – PO MAPPING	COURSE OUTCOMES	PROGRAM OUTCOME											
		1	2	3	4	5	6	7	8	9	10	11	12
	CO1	3											
	CO2	2	2										
	CO3	2											
	CO4	2											
	CO5	3											

UNIT I WATER TECHNOLOGY 9

Introduction to boiler feed water-requirements-formation of deposits in steam boilers and heat exchangers-disadvantages (wastage of fuels, decrease in efficiency, boiler explosion) prevention of scale formation -softening of hard water -external treatment zeolite and demineralization - internal treatment- boiler compounds (phosphate, calgon, carbonate, colloidal) - caustic embrittlement-boiler corrosion-priming and foaming- desalination of brackish water –reverse osmosis.

UNIT II ELECTROCHEMISTRY AND CORROSION 9

Electrochemical cell - redox reaction, electrode potential- origin of electrode potential- oxidation potential-reduction potential, measurement and applications - electrochemical series and its significance - Nernst equation (derivation and problems). Corrosion- causes- factors- types-chemical, electrochemical corrosion (galvanic, differential aeration), corrosion control - material selection and design aspects - electrochemical protection – sacrificial anode method and impressed current cathodic method. Paints- constituents and function. Electroplating of Copper and electroless plating of nickel

UNIT III ENERGY SOURCES 9

Introduction- nuclear energy- nuclear fission- controlled nuclear fission- nuclear fusion- differences between nuclear fission and fusion- nuclear chain reactions- nuclear reactor power generator-classification of nuclear reactor- light water reactor- breeder reactor- solar energy conversion- solar cells- wind energy. Batteries and fuel cells:Types of batteries- alkaline battery- lead storage battery-nickel-cadmium battery- lithium battery- fuel cell H_2 -O_2 fuel cell- applications.

UNIT IV ENGINEERING MATERIALS 9

Abrasives: definition, classification or types, grinding wheel, abrasive paper and cloth. Refractories: definition, characteristics, classification, properties – refractoriness and RUL, dimensional stability, thermal spalling, thermal expansion, porosity; Manufacture of alumina, magnesite and silicon carbide, Portland cement-manufacture and properties - setting and hardening of cement, special cement-waterproof and white cement–properties and uses. Glass - manufacture, types, properties and uses.

UNIT V FUELS AND COMBUSTION 9

Fuel: Introduction- classification of fuels- calorific value- higher and lower calorific values- coal-analysis of coal (proximate and ultimate)- carbonization- manufacture of metallurgical coke (Otto Hoffmann method) - petroleum- manufacture of synthetic petrol (Bergius process)- knocking- octane number - diesel oil- cetane number - natural gas- compressed natural gas(CNG)- liquefied petroleum gases(LPG)- producer gas- water gas.

Power alcohol and bio diesel. Combustion of fuels: introduction- theoretical calculation of calorific value- calculation of stoichiometry of fuel and air ratio-ignition temperature- explosive range - flue gas analysis (ORSAT Method). **TOTAL: 45 PERIODS**

Content beyond Syllabus:	• The Institution arranges for guest lectures on recent developments in the field of engineering chemistry. • Audio visual equipments are used extensively so as to enhance learning interest.
Text Books	1. Jain P.C. and Monica Jain, Engineering Chemistry‖, Dhanpat Rai Publishing Company (P) Ltd., New Delhi, 2010 2. Kannan P., Ravikrishnan A, Engineering Chemistry‖, Sri Krishna Hi-tech Publishing Company Pvt. Ltd. Chennai, 2009
Reference Books	1.S.S, Umare S.S, Engineering Chemistry, S. Chand & Company Ltd., New Delhi 2010 2. Sivasankar B.,Engineering Chemistry, Tata McGraw-Hill Publishing Company, Ltd., New Delhi, 2008. 3. Gowariker V.R. , Viswanathan N.V. and Jayadev Sreedhar, Polymer Science, New Age International P (Ltd.,), Chennai, 2006. 4. Ozin G. A. and Arsenault A. C.,Nanochemistry: A Chemical Approach to Nanomaterials, RSC Publishing, 2005.
Website:	www.nptel.iitm.ac.in ocw.mit.edu
ONLINE RESOURCES	Online lecture notes on Thermodynamics, Polymers, spectroscopy, phase rule and etc

EC6201 ELECTRONIC DEVICES L T P C
3 0 0 3

PREREQUISITE:	Basic Electronics	
COURSE OBJECTIVES:	• To be exposed to basic electronic devices • To be familiar with the theory, construction, and operation of basic electronic devices.	
COURSE OUTCOMES	CO1	To be familiar with the theory, operations of PN Junction Diode.
	CO2	To be familiar with the theory, operations of Bipolar Junction Transistor
	CO3	To be familiar with the theory, operations of Field Effect Transistor.
	CO4	To be familiar with the theory, operations of Special Semiconductor Diode.
	CO5	To be familiar with the theory, operations of power devices

CO – PO MAPPING	COURSE OUTCOMES	PROGRAM OUTCOME											
		1	2	3	4	5	6	7	8	9	10	11	12
	CO1	3	2	2									
	CO2		3	3	2								
	CO3	3	2	2									
	CO4		3	2									
	CO5		3	2									

UNIT I SEMICONDUCTOR DIODE 9

PN junction diode, Current equations, Diffusion and drift current densities, forward and reverse bias characteristics, Switching Characteristics.

UNIT II BIPOLAR JUNCTION 9

NPN -PNP -Junctions-Early effect-Current equations – Input and Output characteristics of CE, CB CC-Hybrid -π model - h-parameter model, Ebers Moll Model- Gummel Poon-model, Multi Emitter Transistor

UNIT III FIELD EFFECT TRANSISTORS 9

JFETs – Drain and Transfer characteristics,-Current equations-Pinch off voltage and its significance-MOSFET-Characteristics- Threshold voltage -Channel length modulation, D-MOSFET, E-MOSFET-,Current equation - Equivalent circuit model and its parameters, FINFET,DUAL GATE MOSFET.

UNIT IV SPECIAL SEMICONDUCTOR DEVICES 9

Metal-Semiconductor Junction- MESFET, Schottky barrier diode-Zener diode-Varactor diode –Tunnel diode-Gallium Arsenide device, LASER diode, LDR.

UNIT V POWER DEVICES AND DISPLAY DEVICES 9

UJT, SCR, Diac, Triac, Power BJT- Power MOSFET- DMOS-VMOS. LED, LCD, Photo transistor, Opto Coupler, Solar cell, CCD.

TOTAL: 45 PERIODS

Content beyond Syllabus:	Analysis of circuits using inspection method
Text Books	Joseph A. Edminister, Mahmood, Nahri, "Electric Circuits" – Shaum series,Tata McGraw Hill, (2001) S. Salivahanan, N. Suresh kumar and A. Vallavanraj, "Electronic Devices and Circuits",Tata McGraw Hill, 2Nd Edition, (2008). David A. Bell, "Electronic Devices and Circuits", Oxford University Press, 5 th Edition,(2008).
Reference Books	Robert T. Paynter, "Introducing Electronics Devices and Circuits", Pearson Education, 7th Education, (2006). William H. Hayt, J.V. Jack, E. Kemmebly and steven M. Durbin, "Engineering Circuit Analysis",Tata McGraw Hill, 6thEdition, 2002. J. Millman & Halkins, Satyebranta Jit, "Electronic Devices & Circuits",Tata McGraw Hill, 2nd Edition, 2008.
Website:	www.nptel.iitm.ac.in ocw.mit.edu
ONLINE RESOURCES	PPT Presentation Online Objective Questions Videos Materials if any (You tube)

EE6201 **CIRCUIT THEORY** **L T P C**
3 1 0 4

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PREREQUISITE:	Basic circuits											
COURSE OBJECTIVES:	• To impact the knowledge of about Basic Circuits Analysis. • To know about Network Reduction & Network Theorems. • To know about Transient Response for DC circuits. • To impact the knowledge of about electronic devices and its characteristics											
COURSE OUTCOMES	CO1	Discuss the methods of transistors										
	CO2	Interpret the midband analysis of amplifier circuits using small – signal equivalent circuits to determine gain input impedance and output impedance										
	CO3	Examine the methods of calculating cutoff frequencies and to determine bandwidth										
	CO4	Discuss the classification of large signal amplifiers										
	CO5	Perform the classifications of rectifiers and power supplies										
CO – PO MAPPING	COURSE OUTCOMES	PROGRAM OUTCOME										
		1	2	3	4	5	6	7	8	9	10	11	12
	CO1	3	2	2									
	CO2		3	3	2								
	CO3	3	2	2									
	CO4		3	2									
	CO5		3	2									

UNIT I BASIC CIRCUITS ANALYSIS **12**

Ohm‟s Law – Kirchoffs laws – DC and AC Circuits – Resistors in series and parallel circuits – Mesh current and node voltage method of analysis for D.C and A.C. circuits – Phasor Diagram – Power, Power Factor and Energy

UNIT II NETWORK REDUCTION AND NETWORK THEOREMS FOR DC AND AC CIRCUITS **12**

Network reduction: voltage and current division, source transformation – star delta conversion. Thevenins and Novton & Theorem – Superposition Theorem – Maximum power transfer theorem – Reciprocity Theorem.

UNIT III RESONANCE AND COUPLED CIRCUITS **12**

Series and paralled resonance – their frequency response – Quality factor and Bandwidth - Self and mutual inductance – Coefficient of coupling – Tuned circuits – Single tuned circuits

UNIT IV TRANSIENT RESPONSE FOR DC CIRCUITS **12**

Transient response of RL, RC and RLC Circuits using Laplace transform for DC input and A.C. with sinusoidal input – Characterization of two port networks in terms of Z,Y and h parameters.

UNIT V THREE PHASE CIRCUITS **12**

Three phase balanced / unbalanced voltage sources – analysis of three phase 3-wire and 4-wire circuits with star and delta connected loads, balanced & un balanced – phasor diagram of voltages and currents – power and power factor measurements in three phase circuits.

TOTAL: 60 PERIODS

Content beyond Syllabus:	Analysis of circuits using inspection method
Text Books	Joseph A. Edminister, Mahmood, Nahri, "Electric Circuits" – Shaum series,Tata McGraw Hill, (2001) S. Salivahanan, N. Suresh kumar and A. Vallavanraj, "Electronic Devices and Circuits",Tata McGraw Hill, 2Nd Edition, (2008). David A. Bell, "Electronic Devices and Circuits", Oxford University Press, 5 th Edition,(2008).
Reference Books	Robert T. Paynter, "Introducing Electronics Devices and Circuits", Pearson Education, 7th Education, (2006). William H. Hayt, J.V. Jack, E. Kemmebly and steven M. Durbin, "Engineering Circuit Analysis",Tata McGraw Hill, 6thEdition, 2002. J. Millman & Halkins, Satyebranta Jit, "Electronic Devices & Circuits",Tata McGraw Hill, 2nd Edition, 2008.
Website:	www.nptel.iitm.ac.in ocw.mit.edu
ONLINE RESOURCES	PPT Presentation Online Objective Questions Videos Materials if any (You tube)

GE6262 PHYSICS AND CHEMISTRY LABORATORY – II L T P C
0 0 2 1

PREREQUISITE:	PHYSICS LABOROTORY I												
COURSE OBJECTIVES:	• To design and conduct experiment, as well as to analyze and interpret data. • To get knowledge of contemporary analytical and experimental techniques												
COURSE OUTCOMES	CO1	Choose the method of optical interference can be used to measure small distances.											
	CO2	Apply the semiconductor knowledge in semiconducting materials by calculating the forbidden energy gap of a germanium semiconductor. It is to understand the band gap with function of temperature											
	CO3	Design the basic principle in the coefficient of viscosity of water using the Poiseuille's method of liquid flow through a capillary tube of uniform cross section.											
	CO4	Make use of the Interference, Diffraction phenomena, dispersive power of a prism which will be clearly visualized with the experiments											
	CO5	Develop the knowledge gain to compute basic quantities in rotational mechanics.											
CO – PO MAPPING	COURSE OUTCOMES	PROGRAM OUTCOME											
		1	2	3	4	5	6	7	8	9	10	11	12
	CO1	1								1			
	CO2	1								1			
	CO3	1								1			
	CO4	1								1			
	CO5	1								1			

(Any FIVE Experiments)

1. Determination of Young‟s modulus by uniform bending method
2. Determination of band gap of a semiconductor
3. Determination of Coefficient of viscosity of a liquid –Poiseuille‟s method
4. Determination of Dispersive power of a prism - Spectrometer
5. Determination of thickness of a thin wire – Air wedge method
6. Determination of Rigidity modulus – Torsion pendulum

CHEMISTRY LABORATORY –II

PREREQUISITE:	CHEMISTRY LABORATORY – I												
COURSE OBJECTIVES:	• To improve the knowledge of different types of titrations used in volumetric analysis • To make students develop in terms of practical skills required for analytical projects. • To imbibe the advantages of instrumental methods of chemical analysis												
COURSE OUTCOMES	CO1	Analyze the water pH and estimate the inorganic and organic impurities from the water sample. Assess the quality of water based on the analysis done by them.											
	CO2	Determine the different types of conduct metric titrations in the volumetric analysis											
	CO3	Acquire practical knowledge related to the concept of redox reactions											
	CO4	Estimate the handling maintenance and performance of analytical instruments.											
	CO5	Apply the practical knowledge of various chemical phenomena by demonstration of experiments.											
CO – PO MAPPING	COURSE OUTCOMES	PROGRAM OUTCOME											
		1	2	3	4	5	6	7	8	9	10	11	12
	CO1	3			3								
	CO2	2	2		3								
	CO3	2			2								
	CO4	2			3								
	CO5	3			3								

(Any FIVE Experiments)

1 Determination of alkalinity in water sample
2 Determination of total, temporary & permanent hardness of water by EDTA method
3 Estimation of copper content of the given solution by EDTA method
4 Estimation of iron content of the given solution using potentiometer
5 Estimation of sodium present in water using flame photometer
6 Corrosion experiment – weight loss method
7 Conductometric precipitation titration using $BaCl_2$ and Na_2SO_4
8 Determination of CaO in Cement.

TOTAL : 30 PERIODS

EC6211 **CIRCUITS AND DEVICES LABORATORY** **L T P C**
0 0 3 2

PREREQUISITE:	Electronic Devices												
COURSE OBJECTIVES:	1. To impact the knowledge of about Basic Circuits Analysis. 2. To impact the knowledge of about electronic devices and its characteristics. 3. To know about Network Reduction & Network Theorems												
COURSE OUTCOMES	CO1	Show the characteristics of basic electronic devices											
	CO2	Design RL and RC circuits											
	CO3	Illustrate Thevinin & Norton theorem KVL & KCL, and Super Position Theorems											
	CO4	Determination Of Resonance Frequency of Series & Parallel RLC Circuits											
	CO5	Analyze FET, SCR Characteristics Clipper ,Clamper & FWR											
CO – PO MAPPING	COURSE OUTCOMES	PROGRAM OUTCOME											
		1	2	3	4	5	6	7	8	9	10	11	12
	CO1	3		2									
	CO2			3									
	CO3	3		2									
	CO4	2			2								
	CO5		2		2								

LIST OF EXPERIMENTS:

1. Characteristics of PN Junction Diode
2. Zener diode Characteristics & Regulator using Zener diode
3. Common Emitter input-output Characteristics
4. Common Base input-output Characteristics
5. FET Characteristics
6. SCR Characteristics
7. Clipper and Clamper & FWR
8. Verifications Of Thevinin & Norton theorem
9. Verifications Of KVL & KCL
10. Verifications Of Super Position Theorem
11. verifications of maximum power transfer & reciprocity theorem
12. Determination Of Resonance Frequency of Series & Parallel RLC Circuits
13. Transient analysis of RL and RC circuits

TOTAL: 45 PERIODS

Content beyond Syllabus:	: 1. RL & RC circuits for DC input
Reference Books	1. Paranjothi SR, "Electric Circuits Analysis," New Age International Ltd., New Delhi, (1996). 2. Joseph A. Edminister, Mahmood Nahri, "Electric circuits", Schaum's series, Tata McGraw-Hill, New Delhi (2001). 3. Chakrabati A, "Circuits Theory (Analysis and synthesis), Dhanpath Rai & Sons, New Delhi, (1999). 4. Charles K. Alexander, Mathew N.O. Sadik, "Fundamentals of Electric Circuits", Second Edition, McGraw Hill, (2003). . 5. R.S. Sedha, "Applied Electronics" S. Chand & Co., 2006.
Website:	www.nptel.iitm.ac.in ocw.mit.edu
ONLINE RESOURCES	PPT Presentation Online Objective Questions Videos Materials if any (You tube)

MA6351 TRANSFORMS AND PARTIAL DIFFERENTIAL EQUATIONS L T P C
3 1 0 4

PREREQUISITE:	Mathematics I & Mathematics II												
COURSE OBJECTIVES:	1. To have thorough knowledge in Fourier series 2. To gain good knowledge in the application of Fourier transform 3. To know to formulate and solve partial differential equations 4. To be familiar with applications of partial differential equations 5. To learn about Z- transforms and its applications												
COURSE OUTCOMES	CO1	Understand the mathematical principles on transforms and partial differential equations.											
	CO2	Develop the formulate and solve some of the physical problems in engineering											
	CO3	Understand the fundamentals of Fourier series & Fourier Transform											
	CO4	Familiarize the partial differential equation on any mathematical problem											
	CO5	Analyze Z transform and Inverse Z transform											
CO – PO MAPPING	COURSE OUTCOMES	PROGRAM OUTCOME											
		1	2	3	4	5	6	7	8	9	10	11	12
	CO1	3	2							1			
	CO2	3	2							1			
	CO3	2	3							1			
	CO4	3	3							1			
	CO5	2	3							1			

UNIT I PARTIAL DIFFERENTIAL EQUATIONS 9+3

Formation of partial differential equations – Singular integrals -- Solutions of standard types of first order partial differential equations - Lagrange‟s linear equation -- Linear partial differential equations of second and higher order with constant coefficients of both homogeneous and non-homogeneous types

UNIT II FOURIER SERIES 9+3

Dirichlet‟s conditions – General Fourier series – Odd and even functions – Half range sine series – Half range cosine series – Complex form of Fourier series – Parseval‟s identity – Harmonic analysis.

UNIT III APPLICATIONS OF PARTIAL DIFFERENTIAL EQUATIONS 9+3

Classification of PDE – Method of separation of variables - Solutions of one dimensional wave equation – One dimensional equation of heat conduction – Steady state solution of two dimensional equation of heat conduction (excluding insulated edges).

UNIT IV FOURIER TRANSFORMS 9+3

Statement of Fourier integral theorem – Fourier transform pair – Fourier sine and cosine transforms – Properties – Transforms of simple functions – Convolution theorem – Parseval‟s identity.

UNIT VZ - TRANSFORMS AND DIFFERENCE EQUATIONS 9+3

Z- transforms - Elementary properties – Inverse Z - transform (using partial fraction and residues) – Convolution theorem - Formation of difference equations – Solution of difference equations using Z - transform.

TOTAL (L:45+T:15): 60 PERIODS

Content beyond Syllabus:	Classification of PDE and their Applications oriented problems in Engineering.
Text Books	1. Grewal, B.S, "Higher Engineering Mathematic", 40th Edition, Khanna publishers, Delhi, (2007)
Reference Books	1. Bali.N.P and Manish Goyal, "A Textbook of Engineering Mathematic", 7th Edition, Laxmi Publications(P) Ltd. (2007) 2. Ramana.B.V., "Higher Engineering Mathematics", Tata Mc-GrawHill Publishing Company limited, New Delhi (2007). 3. Glyn James, "Advanced Modern Engineering Mathematics", 3rd Edition, Pearson Education (2007). 4. Erwin Kreyszig, "Advanced Engineering Mathematics", 8th edition, Wiley India (2007).
Website:	http://www.mathresource.iitb.ac.in/mainchapter10.3. html www.nptel.in
ONLINE RESOURCES	PPT Presentation Online Objective Questions Videos Materials if any (You tube)

EE6352 ELECTRICAL ENGINEERING AND INSTRUMENTATION L T P C

3 1 0 4

PREREQUISITE:	Basic Electrical	
COURSE OBJECTIVES:	1. To impart knowledge on Constructional details, principle of operation, performance, starters and testing of D.C. machines. 2. Constructional details, principle of operation and performance of transformers. 3. Constructional details, principle of operation and performance of induction motors. 4. Constructional details and principle of operation of alternators and special machines. 5. Power System transmission and distribution	
COURSE OUTCOMES	CO1	Justify various types of motors and have the knowledge regarding Constructional details and its characteristics.
	CO2	Discuss and examine the classifications of transformation ratio –Transformer on no load – Parameters referred to HV/LV windings
	CO3	Analyze, design and explain various transmission line parameters and circuits
	CO4	Applying and demonstrating the Construction of synchronous machines to understand the behavior Reluctance motor – Hysteresis motor
	CO5	Infer the knowledge about transmission and distribution systems and EHVAC and EHVDC transmission systems.

CO – PO MAPPING	COURSE OUTCOMES	PROGRAM OUTCOME											
		1	2	3	4	5	6	7	8	9	10	11	12
	CO1	3			2								

	CO2		2		3								
	CO3		3	2									
	CO4			3		2							
	CO5	3		2									

UNIT I DC MACHINES **9**

Three phase circuits, a review. Construction of DC machines – Theory of operation of DC generators – Characteristics of DC generators- Operating principle of DC motors – Types of DC motors and their characteristics – Speed control of DC motors- Applications.

UNIT II TRANSFORMER **9**

Introduction – Single phase transformer construction and principle of operation – EMF equation of transformer- Transformer no–load phasor diagram — Transformer on–load phasor diagram — Equivalent circuit of transformer – Regulation of transformer –Transformer losses and efficiency-All day efficiency –auto transformers.

UNIT IIIINDUCTION MACHINES AND SYNCHRONOUS MACHINES **9**

Principle of operation of three-phase induction motors – Construction –Types – Equivalent circuit – Construction of single-phase induction motors – Types of single phase induction motors – Double revolving field theory – starting methods - Principles of alternator – Construction details – Types – Equation of induced EMF – Voltage regulation. Methods of starting of synchronous motors – Torque equation – V curves – Synchronous motors.

UNIT IVBASICS OF MEASUREMENT AND INSTRUMENTATION **9**

Static and Dynamic Characteristics of Measurement – Errors in Measurement - Classification of Transducers – Variable resistive – Strainguage, thermistor RTD – transducer - Variable Capacitive Transducer – Capacitor Microphone - Piezo Electric Transducer – Variable Inductive transducer – LVDT, RVDT

UNIT VANALOG AND DIGITAL INSTRUMENTS **9**

DVM, DMM – Storage Oscilloscope. Comparison of Analog and Digital Modes of operation, Application of measurement system, Errors. Measurement of R, L and C, Wheatstone, Kelvin, Maxwell, Anderson, Schering and Wien bridges Measurement of Inductance, Capacitance, Effective resistance at high frequency, Q-Meter.

TOTAL (L:45+T:15): 60 PERIODS

Content beyond Syllabus:	Vector group of transformer
Text Books	1. S.K.Bhattacharya, 'Electrical Machines', Tata McGraw Hill Publishing company ltd, second edition, 2007. 2. V.K.Mehta and Rohit Mehta, 'Principles of Power System', S.Chand and CompanyLtd, second edition, 2006
Reference Books	7. D.P.Kothari and I.J.Nagrath, 'Basic Electrical Engineering', Tata McGraw Hill publishing company ltd, second edition, 2007 (Reprint). 8. C.L. Wadhwa, 'Electrical Power Systems', New Age International, fourth edition, 2007.
Website:	1. www.nptel.iitm.ac.in ocw.mit.edu
ONLINE RESOURCES	PPT Presentation Online Objective Questions Videos Materials if any (You tube)

EC6301 OBJECT ORIENTED PROGRAMMING AND DATA STRUCTURES L T P C
3 0 0 3

PREREQUISITE:	FOC												
COURSE OBJECTIVES:	To learn the systematic way of solving problems To understand the different methods of organizing large amounts of data To learn to program in C++ To efficiently implement the different data structures To efficiently implement solutions for specific problems												
COURSE OUTCOMES	CO1	Understand about Object oriented programming.											
	CO2	Explain the Virtual functions, polymorphism and File Handling.											
	CO3	Formulate the algorithm for Stacks and queues.											
	CO4	Categorize Graph Algorithms , Topological sort and minimum spanning tree											
	CO5	Implement the Greedy algorithm and Dynamic Programming.											
CO – PO MAPPING	COURSE OUTCOMES	PROGRAM OUTCOME											
		1	2	3	4	5	6	7	8	9	10	11	12
	CO1	3										2	
	CO2	3		2									
	CO3			3								2	
	CO4			3									
	CO5			3								2	

UNIT I DATA ABSTRACTION & OVERLOADING 9

Overview of C++ – Structures – Class Scope and Accessing Class Members – Reference Variables – Initialization – Constructors – Destructors – Member Functions and Classes – Friend Function – Dynamic Memory Allocation – Static Class Members – Container Classes and Integrators – Proxy Classes – Overloading: Function overloading and Operator Overloading.

UNIT II INHERITANCE & POLYMORPHISM 9

Base Classes and Derived Classes – Protected Members – Casting Class pointers and Member Functions – Overriding – Public, Protected and Private Inheritance – Constructors and Destructors in derived Classes – Implicit Derived – Class Object To Base – Class Object Conversion – Composition Vs. Inheritance – Virtual functions – This Pointer – Abstract Base Classes and Concrete Classes – Virtual Destructors – Dynamic Binding.

UNIT III LINEAR DATA STRUCTURES 10

Abstract Data Types (ADTs) – List ADT – array-based implementation – linked list implementation — singly linked lists –Polynomial Manipulation - Stack ADT – Queue ADT - Evaluating arithmetic expressions

UNIT IVNON-LINEAR DATA STRUCTURES **9**

Trees – Binary Trees – Binary tree representation and traversals – Application of trees: Set representation and Union-Find operations – Graph and its representations – Graph Traversals – Representation of Graphs – Breadth-first search – Depth-first search - Connected components.

UNIT V SORTING and SEARCHING **8**

Sorting algorithms: Insertion sort - Quick sort - Merge sort - Searching: Linear search –Binary Search

Content beyond Syllabus:	The disjoint set ADT, equivalence relations & the dynamic equivalence problem
Text Books	Mark Allen Weiss, "Data Structures and Algorithm Analysis in C", 3rd ed, Pearson Education Asia, 2007. E. Balagurusamy, " Object Oriented Programming with C++", McGraw Hill Company Ltd., 2007.
Reference Books	Michael T. Goodrich, "Data Structures and Algorithm Analysis in C++", Wiley student edition, 2007. Sahni, "Data Structures Using C++", The McGraw-Hill, 2006. Seymour, "Data Structures", The McGraw-Hill, 2007. Jean – Paul Tremblay & Paul G.Sorenson, An Introduction to data structures with applications, Tata McGraw Hill edition, II Edition, 2002. John R.Hubbard, Schaum's outline of theory and problem of data structure with C++,McGraw-Hill, New Delhi, 2000. Bjarne Stroustrup, The C++ Programming Language, Addison Wesley, 2000 Robert Lafore, Object oriented programming in C++, Galgotia Publication
Website:	www.nptel.iitm.ac.in ocw.mit.edu
ONLINE RESOURCES	PPT Presentation Online Objective Questions Videos Materials if any (You tube)

EC6302 **DIGITAL ELECTRONICS** **L T P C**
3 0 0 3

PREREQUISITE:	Basic logic gates	
COURSE OBJECTIVES:	To introduce basic postulates of Boolean algebra and shows the correlation between Boolean expressions. To introduce the methods for simplifying Boolean expressions To outline the formal procedures for the analysis and design of combinational circuits To outline the formal procedures for the analysis and design of sequential circuits. To introduce the concept of memories and programmable logic devices. To illustrate the concept of synchronous and asynchronous sequential circuits	
COURSEOUTCOMES	CO1	Infer the methods of minimizing the Boolean expressions
	CO2	Compose the digital combinational circuits
	CO3	Restate the synchronous and asynchronous sequential circuits
	CO4	Illustrate the classifications of memories and programmable logic devices
	CO5	Design the synchronous and asynchronous sequential circuits using VERILOG

CO – PO MAPPING	COURSE OUTCOMES	PROGRAM OUTCOME											
		1	2	3	4	5	6	7	8	9	10	11	12
	CO1	3	3	3	2								2
	CO2	3	3	3									2
	CO3	3	3	3									2

	CO4	3	3	3									
	CO5	3	3	3	2							2	2

UNIT I MINIMIZATION TECHNIQUES AND LOGIC GATES 9 Minimization Techniques: Boolean postulates and laws – De-Morgan‟s Theorem - Principle of Duality - Boolean expression - Minimization of Boolean expressions — Minterm – Maxterm - Sum of Products (SOP) – Product of Sums (POS) – Karnaugh map Minimization – Don‟t care conditions – Quine - Mc Cluskey method of minimization.

Logic Gates: AND, OR, NOT, NAND, NOR, Exclusive–OR and Exclusive–NOR Implementations of Logic Functions using gates, NAND–NOR implementations – Multi

level gate implementations- Multi output gate implementations. TTL and CMOS Logic and their characteristics – Tristate gates

UNIT II COMBINATIONAL CIRCUITS 9

Design procedure – Half adder – Full Adder – Half subtractor – Full subtractor – Parallel binary adder, parallel binary Subtractor – Fast Adder - Carry Look Ahead adder – Serial Adder/Subtractor - BCD adder – Binary Multiplier – Binary Divider - Multiplexer/ Demultiplexer – decoder - encoder – parity checker – parity generators – code converters - Magnitude Comparator.

UNIT III SEQUENTIAL CIRCUITS 9

Latches, Flip-flops - SR, JK, D, T, and Master-Slave – Characteristic table and equation –Application table – Edge triggering – Level Triggering – Realization of one flip flop using other flip flops – serial adder/subtractor- Asynchronous Ripple or serial counter – Asynchronous Up/Down counter - Synchronous counters – Synchronous Up/Down counters – Programmable counters – Design of Synchronous counters: state diagram- State table –State minimization –State assignment - Excitation table and maps-Circuit implementation - Modulo–n counter, Registers – shift registers - Universal shift registers – Shift register counters – Ring counter – Shift counters - Sequence generators.

UNIT IV MEMORY DEVICES 9

Classification of memories – ROM - ROM organization - PROM – EPROM – EEPROM –EAPROM, RAM – RAM organization – Write operation – Read operation – Memory cycle - Timing wave forms – Memory decoding – memory expansion – Static RAM Cell- Bipolar RAM cell – MOSFET RAM cell – Dynamic RAM cell –Programmable Logic Devices – Programmable Logic Array (PLA) - Programmable Array Logic (PAL) – Field Programmable Gate Arrays (FPGA) - Implementation of combinational logic circuits using ROM, PLA, PAL

UNIT V SYNCHRONOUS AND ASYNCHRONOUS SEQUENTIAL CIRCUITS 9

Synchronous Sequential Circuits: General Model – Classification – Design – Use of Algorithmic State Machine – Analysis of Synchronous Sequential Circuits

Asynchronous Sequential Circuits: Design of fundamental mode and pulse mode circuits – Incompletely specified State Machines – Problems in Asynchronous Circuits – Design of Hazard Free Switching circuits. Design of Combinational and Sequential circuits using VERILOG.

TOTAL: 45 PERIODS

Content beyond Syllabus:	1.Flash Memory
Text Books	M. Morris Mano, Digital Design, 3rd Edition, Prentice Hall of India Pvt. Ltd., 2003 / Pearson Education (Singapore) Pvt. Ltd., New Delhi, 2003. S. Salivahanan and S. Arivazhagan, Digital Circuits and Design, 3rd Edition., Vikas Publishing House Pvt. Ltd, New Delhi, 2006
Reference Books	John F.Wakerly, Digital Design, Fourth Edition, Pearson/PHI, 2006 John.M Yarbrough, Digital Logic Applications and Design, Thomson Learning, 2002. Charles H.Roth. Fundamentals of Logic Design, Thomson Learning, 2003. Donald P.Leach and Albert Paul Malvino, Digital Principles and Applications, 6th William H. Gothmann, Digital Electronics, 2nd Edition, PHI, 1982.

	Thomas L. Floyd, Digital Fundamentals, 8th Edition, Pearson Education Inc, New Donald D.Givone, Digital Principles and Design,
Website:	www.nptel.iitm.ac.in ocw.mit.edu
ONLINE RESOURCES	PPT Presentation Online Objective Questions Videos Materials if any (You tube)

EC6303 SIGNALS AND SYSTEMS L T P C
3 1 0 4

PREREQUISITE:	Mathematics-II												
COURSE OBJECTIVES:	To study the properties and representation of discrete and continuous signals. To study the sampling process and analysis of discrete systems using z-transforms. To study the analysis and synthesis of discrete time systems												
COURSE OUTCOMES	CO1	Discuss and identify the different types of signals and systems											
	CO2	Investigate the continuous time signals using flourier series, Fourier transform and laplace transform											
	CO3	Predict the linear time invariant continuous time systems											
	CO4	Perform the discrete time signals using Discrete time fourier transform and Z- transform											
	CO5	Analyze the linear time invariant discrete time systems											
CO – PO MAPPING	COURSE OUTCOMES	PROGRAM OUTCOME											
		1	2	3	4	5	6	7	8	9	10	11	12
	CO1	3	2										
	CO2	3	2										
	CO3	3	2										
	CO4	3	2										
	CO5	3	3			2							

UNIT I CLASSIFICATION OF SIGNALS AND SYSTEMS 9

Continuous time signals (CT signals) - Discrete time signals (DT signals) - Step, Ramp, Pulse, Impulse, Sinusoidal, Exponential, Classification of CT and DT signals - Periodic & Aperiodic signals, Deterministic & Random signals, Energy & Power signals - CT systems and DT systems-Classification of systems – Static & Dynamic, Linear & Nonlinear, Time-variant & Time-invariant, Causal & Noncausal, Stable & Unstable.

UNIT II ANALYSIS OF CONTINUOUS TIME SIGNALS 9

Fourier series analysis-spectrum of Continuous Time (CT) signals- Fourier and Laplace Transforms in CT Signal Analysis - Properties.

UNIT III LINEAR TIME INVARIANT- CONTINUOUS TIME SYSTEMS 9

Differential Equation-Block diagram representation-impulse response, convolution integrals-Fourier and Laplace transforms in Analysis of CT systems

UNIT IV ANALYSIS OF DISCRETE TIME SIGNALS 9

Baseband Sampling - DTFT – Properties of DTFT - Z Transform – Properties of Z Transform

UNIT VLINEAR TIME INVARIANT-DISCRETE TIME SYSTEMS **9**

Difference Equations-Block diagram representation-Impulse response - Convolution sum- Discrete Fourier and Z Transform Analysis of Recursive & Non-Recursive systems

TOTAL (L:45+T:15): 60 PERIODS

Content beyond Syllabus:	Fast Fourier Transform
Text Books	Allan V.Oppenheim, S.Wilsky and S.H.Nawab, Signals and Systems, Pearson Education, 2007. Edward W Kamen & Bonnie's Heck, "Fundamentals of Signals and Systems", Pearson Education, 2007
Reference Books	H P Hsu, Rakesh Ranjan" Signals and Systems", Schaum's Outlines, Tata McGraw Hill, Indian Reprint, 2007 S.Salivahanan, A. Vallavaraj, C. Gnanapriya, Digital Signal Processing, McGraw Hill International/TMH, 2007. Simon Haykins and Barry Van Veen, Signals and Systems John Wiley & sons , Inc, 2004. Robert A. Gabel and Richard A.Roberts, Signals & Linear Systems, John Wiley, III edition, 1987. Rodger E. Ziemer, William H. Tranter, D. Ronald Fannin. Signals & systems, Fourth Edition, Pearson Education, 2002.
Website:	www.nptel.iitm.ac.in ocw.mit.edu
ONLINE RESOURCES	PPT Presentation Online Objective Questions Videos Materials if any (You tube)

EC6304 **ELECTRONIC CIRCUITS – I** **L T P C**

3 1 0 4

PREREQUISITE:	Electric Circuit and Electron Devices												
COURSE OBJECTIVES:	On completion of this course the student will understand the methods of biasing transistors Design of simple amplifier circuits Midband analysis of amplifier circuits using small - signal equivalent circuits to determine gain input impedance and output impedance Method of calculating cutoff frequencies and to determine bandwidth Design of power amplifiers Analysis and design of power supplies												
COURSE OUTCOMES	CO1	Discuss the methods of biasing the transistors											
	CO2	Categorize the midband analysis of amplifier circuits using small –signal equivalent circuits to determine gain input impedance and output impedance											
	CO3	Examine the methods of calculating cutoff frequencies and to determine bandwidth											
	CO4	Discuss the classification of large signal amplifiers											
	CO5	Analyze the classifications of rectifiers and power supplies											
CO – PO MAPPING	COURSE OUTCOMES	PROGRAM OUTCOME											
		1	2	3	4	5	6	7	8	9	10	11	12
	CO1	3		2									

	CO2		3	2									
	CO3		3	3									
	CO4	3											
	CO5		3	2									

UNIT I POWER SUPPLIES AND BIASING OF DISCRETE BJT AND MOSFET 9 Rectifiers with filters- DC Load line, operating point, Various biasing methods for BJT-Design-Stability-Bias compensation, Thermal stability, Design of biasing for JFET, Design of biasing for MOSFET

UNIT II BJT AMPLIFIERS 9

Small signal Analysis of Common Emitter-AC Load line, Voltage swing limitations, Common collector and common base amplifiers – Differential amplifiers- CMRR- Darlington Amplifier- Bootstrap technique - Cascaded stages - Cascode Amplifier-**Large signal Amplifiers – Class A , Class B and Class C Power Amplifiers .**

UNIT IIIJFET AND MOSFET AMPLIFIERS 9

Small signal analysis of JFET amplifiers- Small signal Analysis of MOSFET and JFET, Common source amplifier, Voltage swing limitations, Small signal analysis of MOSFET and JFET Source follower and Common Gate amplifiers, - BiMOS Cascode amplifier

UNIT IV FREQUENCY ANALYSIS OF BJT AND MOSFET AMPLIFIERS 9

Low frequency and Miller effect, High frequency analysis of CE and MOSFET CS amplifier, Short circuit current gain, cut off frequency – fα and fβ unity gain and Determination of bandwidth of single stage and multistage amplifiers

UNIT V IC MOSFET AMPLIFIERS 9

IC Amplifiers- IC biasing Current steering circuit using MOSFET- MOSFET current sources- PMOS and NMOS current sources. Amplifier with active loads - enhancement load, Depletion load and PMOS and NMOS current sources load- CMOS common source and source follower- CMOS differential amplifier- CMRR.

TOTAL (L: 45+T: 15): 60 PERIODS

Content beyond Syllabus:	Class C amplifier using FET
Text Books	1. Millman J and Halkias .C, Integrated Electronics, TMH, 2007. 2. S. Salivahanan, N. Suresh Kumar and A. Vallavaraj, Electronic Devices and Circuits,2nd Edition, TMH, 2007.
Reference Books	1. Robert L. Boylestad and Louis Nashelsky, Electronic Devices and Circuit Theory, 9th Edition, Pearson Education / PHI, 2007. 2. David A. Bell, Electronic Devices & Circuits, 4th Ediion, PHI, 2007 3. Floyd, Electronic Devices, Sixth Edition, Pearson Education, 2002. 4. I.J. Nagrath, Electronic Devices and Circuits, PHI, 2007. 5. Anwar A. Khan and Kanchan K. Dey, A First Course on Electronics, PHI, 2006. 6. B.P. Singh and Rekha Singh, Electronic Devices and Integrated Circuits, Pearson Education, 2006. 7. Martin Reissland, 'Electrical Measurements', New Age International (P) Ltd., Delhi, 2001.
Website:	www.nptel.iitm.ac.in ocw.mit.edu
ONLINE RESOURCES	PPT Presentation Online Objective Questions

EC6311 ANALOG AND DIGITAL CIRCUITS LABORATORY L T P C

PREREQUISITE:	Digital Electronics												
COURSE OBJECTIVES:	To design and implement various combinational circuits To design and implement various sequential circuits To simulate digital circuits using verilog HDL.												
COURSE OUTCOMES	CO1	Examine and design the combinational circuits using standard gates and minimization methods such as Karnaugh map											
	CO2	Construct the combinational circuits composed of standard combinational modules, such as multiplexers and decoders.											
	CO3	Assess the simple synchronous sequential circuits											
	CO4	Investigate the flip-flops and latches											
	CO5	Compose the combinational and sequential circuits using Verilog Hardware Description Language											
CO – PO MAPPING	COURSE OUTCOMES	PROGRAM OUTCOME											
		1	2	3	4	5	6	7	8	9	10	11	12
	CO1	3	3	2									
	CO2	3	3	2									
	CO3	3	3	2									
	CO4	3	3	2									
	CO5	3	3	2									

LIST OF ANALOG EXPERIMENTS:

1. Half Wave and Full Wave Rectifiers, Filters, Power supplies
2. Frequency Response of CE, CB, CC and CS amplifiers
3. Darlington Amplifier
4. Differential Amplifiers- Transfer characteristic, CMRR Measurement
5. Cascode / Cascade amplifier
6. Class A and Class B Power Amplifiers
7. Determination of bandwidth of single stage and multistage amplifiers
8. Spice Simulation of Common Emitter and Common Source amplifiers

LIST OF DIGITAL EXPERIMENTS

9. Design and implementation of code converters using logic gates
   (i) BCD to excess-3 code and vice versa (ii) Binary to gray and vice-versa
10. Design and implementation of 4 bit binary Adder/ Subtractor and BCD adder using IC 7483
11. Design and implementation of Multiplexer and De-multiplexer using logic gates
12. Design and implementation of encoder and decoder using logic gates
13. Construction and verification of 4 bit ripple counter and Mod-10 / Mod-12 Ripple counters
14. Design and implementation of 3-bit synchronous up/down counter
15. Implementation of SISO, SIPO, PISO and PIPO shift registers using Flip- flops.

TOTAL: 45 PERIODS

Content beyond Syllabus:	Binary To Excess-3 Code Converter
Reference Books	John F.Wakerly, Digital Design, Fourth Edition, Pearson/PHI, 2006 John.M Yarbrough, Digital Logic Applications and Design, Thomson Learning, 2002. Charles H.Roth. Fundamentals of Logic Design, Thomson Learning, 2003.
Website:	www.nptel.iitm.ac.in ocw.mit.edu
ONLINE RESOURCES	PPT Presentation Online Objective Questions Videos Materials if any (You tube)

EC6312 **OOPS AND DATA STRUCTURES LABORATORY** **L T P C**
0 0 3 2

PREREQUISITE:	Fundamentals of Computing												
COURSE OBJECTIVES:	To develop skills in design and implementation of data structure and their application												
COURSE OUTCOMES	CO1	Demonstrate the C++ programs for manipulating stacks, queues, linked lists, trees, and graphs.											
	CO2	Able to analyze and apply good programming design methods for program development											
	CO3	Execute the different data structures for implementing solutions to practical problems.											
	CO4	Perform with Stack ADT - Array and linked list implementations and their application.											
	CO5	Execute the program using Heap Sort , Quick Sort program counter and status register and show how these are used to execute a machine code program.											
CO – PO MAPPING	COURSE OUTCOMES	PROGRAM OUTCOME											
		1	2	3	4	5	6	7	8	9	10	11	12
	CO1	3	2			2							
	CO2		3	2									
	CO3	2		3		2							
	CO4	2		3									
	CO5		2	3		2						2	

LIST OF EXPERIMENTS:

1. Basic Programs for C++ Concepts
2. Array implementation of List Abstract Data Type (ADT)
3. Linked list implementation of List ADT
4. Cursor implementation of List ADT
5. Stack ADT - Array and linked list implementations
6. The next two exercises are to be done by implementing the following source files
   i. Program source files for Stack Application 1
   ii. Array implementation of Stack ADT
   iii. Linked list implementation of Stack ADT
   iv. Program source files for Stack Application 2
   v. An appropriate header file for the Stack ADT should be included in (i) and (iv)
7. Implement any Stack Application using array implementation of Stack ADT (by implementing files (i) and (ii) given above) and then using linked list
8. Implementation of Stack ADT (by using files (i) and implementing file (iii))
9. Implement another Stack Application using array and linked list implementations of Stack ADT (by implementing files (iv) and using file (ii), and then by using files (iv) and (iii))
11. Queue ADT – Array and linked list implementations
12. Search Tree ADT - Binary Search Tree
13. Implement an interesting application as separate source files and using any of the searchable ADT files developed earlier. Replace the ADT file alone with other appropriate ADT files. Compare the performance.
14. Quick Sort

TOTAL: 45 PERIODS

Content beyond Syllabus:	Radix sort Divide and conquer algorithm.
Reference Books	J Michael T. Goodrich, "Data Structures and Algorithm Analysis in C++", Wiley student edition, 2007. Sahni, "Data Structures Using C++", The McGraw-Hill, 2006. Seymour, "Data Structures", The McGraw-Hill, 2007. Jean – Paul Tremblay & Paul G.Sorenson, An Introduction to data structures with applications, Tata McGraw Hill edition, II Edition, 2002. John R.Hubbard, Schaum's outline of theory and problem of data structure with C++,Mc Graw-Hill, New Delhi, 2000. Bjarne Stroustrup, The C++ Programming Language, Addison Wesley, 2000 Robert Lafore, Object oriented programming in C++, Galgotia Publication.
Website:	www.nptel.iitm.ac.in ocw.mit.edu
ONLINE RESOURCES	PPT Presentation Online Objective Questions Videos Materials if any (You tube)

MA6451 PROBABILITY AND RANDOM PROCESSES L T P C

3 1 0 4

PREREQUISITE:	This course aims at providing the necessary basic concepts in random processes. Knowledge of fundamentals and applications of random phenomena will greatly help in the understanding of topics such as signals & systems, pattern recognition, voice and image processing and filtering theory	
COURSE OBJECTIVES:	1. Have a fundamental knowledge of the basic probability concepts. 2. Have a well-founded knowledge of standard distributions which can describe real life Phenomena. 3. Acquire skills in handling situations involving more than one random variable and functions of random variables. 4. Understand and characterize phenomena which evolve with respect to time in probabilistic manner. 5. Be able to analyze the response of random inputs to linear time invariant Systems.	
COURSE OUTCOMES	CO1	Develop the special properties of association that hold in the case of binary random variables, i.e., random variables that take only the values 0 or 1. These properties turn out to be quite useful in applications
	CO2	Understand the two-dimensional functions of independent random variables are used for analysis of positioning accuracy of robot anipulators and various mechanisms
	CO3	Design the Random processes are shown to describe signals and dynamic behavior encountered in engineering systems.
	CO4	Understand the time series analysis, the cross-spectrum is used as part of a frequency domain analysis of the cross-correlation or cross-covariance between two time series. The spectral density is a function of frequency, not a function of time.However, the spectral density of small windows of a longer signal may be calculated, and plotted versus time

		associated with the window.											
	CO5	Implement the mathematical abstraction or dealization linear systems find important applications in automatic control theory, signal processing, and telecommunications.											
CO – PO MAPPING	COURSE OUTCOMES	PROGRAM OUTCOME											
		1	2	3	4	5	6	7	8	9	10	11	12
	CO1	1	2	1								1	1
	CO2	3	3							1			
	CO3	3	3							1			
	CO4	2	3							1			
	CO5	2	3							1			

UNIT I RANDOM VARIABLES 9+3

Discrete and continuous random variables – Moments – Moment generating functions – Binomial, Poisson, Geometric, Uniform, Exponential, Gamma and Normal distributions.

UNIT II TWO - DIMENSIONAL RANDOM VARIABLES 9+3

Joint distributions – Marginal and conditional distributions – Covariance – Correlation and Linear regression – Transformation of random variables.

UNIT IIIRANDOM PROCESSES 9+3

Classification – Stationary process – Markov process - Poisson process – Random telegraph process.

UNIT IV CORRELATION AND SPECTRAL DENSITIES 9+3

Auto correlation functions – Cross correlation functions – Properties – Power spectral density – Cross spectral density – Properties.

UNIT V LINEAR SYSTEMS WITH RANDOM INPUTS 9+3

Linear time invariant system – System transfer function – Linear systems with random inputs – Auto correlation and Cross correlation functions of input and output.

TOTAL (L:45+T:15): 60 PERIODS

Content beyond Syllabus:	1 Assignment can be given to simulate and infer the models developed based on probability and random processes. The students will able to apply the concepts of probability and random process for analyzing the performance of communication systems.
Text Books	1. Oliver C. Ibe, "Fundamentals of Applied probability and Random processes", Elsevier, First Indian Reprint (2007) (For units 1 and 2) 2. Peebles Jr. P.Z., "Probability Random Variables and Random Signal Principles", Tata McGraw-Hill Publishers, Fourth Edition, New Delhi, 2002.(For units 3, 4 and 5)
Reference Books	1. Miller,S.L and Childers, S.L, "Probability and Random Processes with applications to Signal Processing and Communications", Elsevier Inc., First Indian Reprint 2007. 2. H. Stark and J.W. Woods, "Probability and Random Processes with Applications to Signal Processing", Pearson Education (Asia), 3rd Edition,2002. 3. Hwei Hsu, "Schaum's Outline of Theory and Problems of Probability, Random 4. Variables and Random Processes", Tata McGraw-Hill edition, NewDelhi,2004. 5. Leon-Garcia,A, "Probability and Random Processes for Electrical

	Engineering", Pearson Education Asia, Second Edition, 2007. 6. Yates and D.J. Goodman, "Probability and Stochastic Processes", John Wiley and Sons, Second edition, 2005.
Website:	1. This course uses exclusively for providing electronic resource, such as lecturer notes, assignment papers, and sample solutions. Students should make appropriate use of this recourse. http://users.ece.utexas.edu/~gustavo/ee381j.html. http://www2.math.uu.se/research/telecom/software.html. http://www.ifp.illinois.edu/~hajek/Papers/randomprocesses.html. http://www.rle.mit.edu/rgallager/notes.html. http://pdfread.org/pdf/downloads/student-solutions-manual-for-probability-statistics-and.pdf http://pdfread.org/pdf/downloads/probability-and-stochastic-processes-for-engineers-carl.pdf
ONLINE RESOURCES	PPT Presentation Online Objective Questions Videos Materials if any (You tube)

EC6401 **ELECTRONIC CIRCUITS II** **L T P C**

PREREQUISITE:	Electronic Circuits-I												
COURSE OBJECTIVES:	1. The advantages and method of analysis of feedback amplifiers 2. Analysis and design of LC and RC oscillators, tuned amplifiers, wave shaping circuits, multivibrators, blocking oscillators and time base generators .												
COURSE OUTCOMES	CO1	Design and analyze feedback amplifiers.											
	CO2	Compare the generation of LC and RC oscillators.											
	CO3	Analyze the performance of tuned amplifiers.											
	CO4	Categorize about Multivibrators and waveshaping circuits.											
	CO5	Relate the circuits of Blocking oscillators and time base generators.											
CO – PO MAPPING	COURSE OUTCOMES	PROGRAM OUTCOME											
		1	2	3	4	5	6	7	8	9	10	11	12
	CO1	3	3	3	2								
	CO2	3		3	2								
	CO3	3	3	2									
	CO4	3	3	2									
	CO5	3		3	2								

UNIT I FEEDBACK AMPLIFIERS 9

General Feedback Structure – Properties of negative feedback – Basic Feedback Topologies – Feedback amplifiers – Series – Shunt, Series – Series, Shunt – Shunt and Shunt – Series Feedback – Determining the Loop Gain – Stability Problem – Nyquist Plot – Effect of feedback on amplifier poles – Frequency Compensation.

UNIT II OSCILLATORS 9

Classification, Barkhausen Criterion - Mechanism for start of oscillation and stabilization of amplitude, General form of an Oscillator, Analysis of LC oscillators - Hartley, Colpitts,Clapp, Franklin, Armstrong, Tuned collector oscillators, RC oscillators - phase shift –Wienbridge - Twin-T Oscillators, Frequency range of RC and LC Oscillators, Quartz Crystal Construction, Electrical equivalent circuit of Crystal, Miller and Pierce Crystal oscillators, frequency stability of oscillators.

UNIT III TUNED AMPLIFIERS 9

Coil losses, unloaded and loaded Q of tank circuits, small signal tuned amplifiers - Analysis of capacitor coupled single tuned amplifier – double tuned amplifier - effect of cascading single tuned and double tuned amplifiers on bandwidth – Stagger tuned amplifiers – large signal tuned amplifiers – Class C tuned amplifier – Efficiency and applications of Class C tuned amplifier - Stability of tuned amplifiers – Neutralization - Hazeltine neutralization method.

UNIT IVWAVE SHAPING AND MULTIVIBRATOR CIRCUITS 9

RC & RL Integrator and Differentiator circuits – Storage, Delay and Calculation of Transistor Switching Times – Speed-up Capaitor - Diode clippers, Diode comparator - Clampers. Collector coupled and Emitter coupled Astable multivibrator – Monostable multivibrator - Bistable multivibrators - Triggering methods for Bigtable multivibrators - Schmitt trigger circuit

UNIT V BLOCKING OSCILLATORS AND TIMEBASE GENERATORS 9

UJT saw tooth waveform generator, Pulse transformers – equivalent circuit – response - applications, Blocking Oscillator – Free running blocking oscillator - Astable Blocking Oscillators with base timing – Push-pull Astable blocking oscillator with emitter timing, Frequency control using core saturation, Triggered blocking oscillator – Monostable blocking oscillator with base timing – Monostable blocking oscillator with emitter timing, Time base circuits - Voltage-Time base circuit, Current-Time base circuit
– Linearization through adjustment of driving waveform.

TOTAL: 45 PERIODS

Content beyond Syllabus:	working of function generator Voltage regulator design working of triangular wave generator.
Text Books	Sedra / Smith, Micro Electronic Circuits Oxford University Press, 2004. S. Salivahanan, N. Suresh Kumar and A. Vallavaraj, Electronic Devices and Circuits, 2nd Edition, TMH, 2007.
Reference Books	1. Millman J. and Taub H., Pulse Digital and Switching Waveforms, TMH, 2000.Schilling and Belove, Electronic Circuits, 3rd Edition, TMH, 2002. 2.Robert L. Boylestad and Louis Nasheresky, Electronic Devices and Circuit Theory, 9thEdition, Pearson Education / PHI, 2002. 3. David A. Bell, Solid State Pulse Circuits, Prentice Hall of India, 1992. Millman and Halkias. C., Integrated Electronics, TMH, 1991.
Website:	www.nptel.iitm.ac.in.
ONLINE RESOURCES	1.PPT Presentation. 2. Online Objective Questions. 3. Videos Materials if any (You tube).

EC6402 **COMMUNICATION THEORY** **L T P C**

3 0 0 3

PREREQUISITE:	Signals and system.												
COURSE OBJECTIVES:	To provide various Amplitude modulation and demodulation systems. To provide various Angle modulation and demodulation systems. To provide some depth analysis in noise performance of various receiver. To study some basic information theory with some channel coding theorem.												
COURSE OUTCOMES	CO1	Analyze the concept of AM communication systems.											
	CO2	Design Angle modulated communication systems.											
	CO3	Apply the concepts of Random Process to the design of Communication systems.											
	CO4	Classify the noise performance of AM and FM systems.											
	CO5	Categorize the Coding techniques in Information theory.											
CO – PO MAPPING	COURSE OUTCOMES	PROGRAM OUTCOME											
		1	2	3	4	5	6	7	8	9	10	11	12
		3	2	3									
				3		2							
		3		3		2							
		3	2	3									
		3		3	2								

UNIT I AMPLITUDE MODULATION **9**

Generation and detection of AM wave-spectra-DSBSC, Hilbert Transform, Pre-envelope & complex envelope - SSB and VSB –comparison -Superheterodyne Receiver.

UNIT II ANGLE MODULATION **9**

Phase and frequency modulation-Narrow Band and Wind band FM - Spectrum - FM modulation and demodulation – FM Discriminator- PLL as FM Demodulator - Transmission bandwidth.

UNIT III RANDOM PROCESS **9**

Random variables, Central limit Theorem, Random Process, Stationary Processes, Mean, Correlation & Covariance functions, Power Spectral Density, Ergodic Processes, Gaussian Process, Transmission of a Random Process Through a LTI filter.

UNIT IV NOISE CHARACTERIZATION **9**

Noise sources and types – Noise figure and noise temperature – Noise in cascaded systems. Narrow band noise – PSD of in-phase and quadrature noise –Noise performance in AM systems – Noise performance in FM systems – Pre-emphasis and de-emphasis – Capture effect, threshold effect.

UNIT V INFORMATION THEORY **9**

Entropy - Discrete Memoryless channels - Channel Capacity -Hartley - Shannon law - Source coding theorem - Huffman & Shannon - Fano codes

TOTAL: 45 PERIODS

Content beyond Syllabus:	Data compression. Multiplexing-sharing a medium. Digital filters.
Text Books	Dennis Roddy & John Coolen - Electronic Communication (IV Ed.), Prentice Hall of India. Herbert Taub & Donald L Schilling – Principles of Communication Systems (3rd Edition) – Tata McGraw Hill, 2008.

Reference Books	Reference Books: Simon Haykin, Communication Systems, John Wiley & sons, NY, 4th Edition, 2001. Bruce Carlson - Communication Systems. (III Ed.), Mc Graw Hill. B.P.Lathi, Modern Digital and Analog Communication Systems, Third Edition, Oxford Press,2007. R.P Singh and S.D.Sapre, "Communication Systems – Analog and Digital", Tata McGraw Hill, 2nd Edition, 2007. John G. Proakis, Masoud Salehi, Fundamentals of Communication Systems, Pearson Education, 2006.
Website:	www.nptel.iitm.ac.in ocw.mit.edu
ONLINE RESOURCES	PPT Presentation. Online Objective Questions. Videos Materials if any (You tube).

EC6403 ELECTROMAGNETIC FIELDS L T P C
3 1 0 4

PREREQUISITE:	electrical engineering												
COURSE OBJECTIVES:	To analyze fields potentials due to static charges. To understand how materials affect electric fields. To evaluate static magnetic fields. To understand how materials affect magnetic fields. To understand the relation between the fields under time varying situations												
COURSE OUTCOMES	CO1	Analyze field potentials due to static electric fields.											
	CO2	Explain how materials affect electric fields.											
	CO3	Analyze field potentials due to static magnetic fields.											
	CO4	Explain how materials affect magnetic fields.											
	CO5	Perform the relation between the fields under time varying Situations.											
CO – PO MAPPING	Course Outcomes	Program Outcome											
		1	2	3	4	5	6	7	8	9	10	11	12
	CO1	3	3										
	CO2	3	2	2									
	CO3	3	2	2									
	CO4	3	3										
	CO5	3		3									

UNIT I STATIC ELECTRIC FIELD 9

Vector Algebra, Coordinate Systems, Vector differential operator, Gradient, Divergence, Curl, Divergence theorem, Stokes theorem, Coulombs law, Electric field intensity, Point, Line, Surface and Volume charge distributions, Electric flux density, Gauss law and its applications, Gauss divergence theorem, Absolute Electric potential, Potential difference, Calculation of potential differences for different configurations. Electric dipole, Electrostatic Energy and Energy density.

UNIT II CONDUCTORS AND DIELECTRICS 9

Conductors and dielectrics in Static Electric Field, Current and current density, Continuity equation, Polarization, Boundary conditions, Method of images, Resistance of a conductor, Capacitance, Parallel plate, Coaxial and Spherical capacitors, Boundary conditions for perfect dielectric materials,

Poisson‟s equation, Laplace‟s equation, Solution of Laplace equation, Application of Poisson‟s and Laplace‟s equations.

UNIT III STATIC MAGNETIC FIELDS 9

Biot -Savart Law, Magnetic field Intensity, Estimation of Magnetic field Intensity for straight and circular conductors, Ampere‟s Circuital Law, Point form of Ampere‟s Circuital Law, Stokes theorem, Magnetic flux and magnetic flux density, The Scalar and Vector Magnetic potentials, Derivation of Steady magnetic field Laws.

UNIT IV MAGNETIC FORCES AND MATERIALS 9

Force on a moving charge, Force on a differential current element, Force between current elements, Force and torque on a closed circuit, The nature of magnetic materials, Magnetization and permeability, Magnetic boundary conditions involving magnetic fields, The magnetic circuit, Potential energy and forces on magnetic materials, Inductance, Basic expressions for self and mutual inductances, Inductance evaluation for solenoid, toroid, coaxial cables and transmission lines, Energy stored in Magnetic fields.

UNIT V TIME VARYING FIELDS AND MAXWELL'S EQUATIONS 9

Fundamental relations for Electrostatic and Magnetostatic fields, Faraday‟s law for Electromagnetic induction, Transformers, Motional Electromotive forces, Differential form of Maxwell‟s equations, Integral form of Maxwell‟s equations, Potential functions, Electromagnetic boundary conditions, Wave equations and their solutions, Poynting‟s theorem, Time harmonic fields, Electromagnetic Spectrum.

Content beyond Syllabus:	Electrostatic discharge. Reflection of plane wave in a lossless medium. Refraction of plane wave in a lossless medium.
Text Books	W H.Hayt & J A Buck : "Engineering Electromagnetics" TATA McGraw-Hill, 7th Edition 2007 (Unit I,II,III). E.C. Jordan & K.G. Balmain "Electromagnetic Waves and Radiating Systems." Pearson Education/PHI 4nd edition 2006. (Unit IV, V).
Reference Books	Matthew N.O.Sadiku: "Elements of Engineering Electromagnetics" Oxford University Press, 4th edition, 2007 Narayana Rao, N : "Elements of Engineering Electromagnetics" 6th edition, Pearson Education, New Delhi, 2006. Ramo, Whinnery and Van Duzer: "Fields and Waves in Communications Electronics" John Wiley & Sons ,3rd edition 2003. David K.Cheng: "Field and Wave Electromagnetics - Second Edition-Pearson Edition, 2004. G.S.N. Raju, Electromagnetic Field Theory & Transmission Lines, PearsonEducation, 2006
Website:	www.nptel.iitm.ac.in ocw.mit.edu
ONLINE RESOURCES	PPT Presentation. Online Objective Questions. Videos Materials if any (You tube).

EC6404 **LINEAR INTEGRATED CIRCUITS** **L T P C**

3 0 0 3

PREREQUISITE:	ELECTRONIC CIRCUITS-I												
COURSE OBJECTIVES:	To introduce the basic building blocks of linear integrated circuits. To teach the linear and non-linear applications of operational amplifiers. To introduce the theory and applications of analog multipliers and PLL. To teach the theory of ADC and DAC. To introduce the concepts of waveform generation and introduce some special function ICs.												
COURSE OUTCOMES	CO1	Understanding fundamentals of Opamp											
	CO2	Design linear and non linear applications of op – amps.											
	CO3	Analyze applications using analog multiplier and PLL											
	CO4	Distinguish ADC and DAC using op – amps.											
	CO5	Generate waveforms using op – amp circuits and Explain special function of ICs.											
CO – PO MAPPING	Course Outcomes	Program Outcome											
		1	2	3	4	5	6	7	8	9	10	11	12
	CO1	3		3									
	CO2	3	3										
	CO3	3	3										
	CO4	3		3									
	CO5	3			2								

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UNIT I BASICS OF OPERATIONAL AMPLIFIERS 9

Current mirror and current sources, Current sources as active loads, Voltage sources, Voltage References, BJT Differential amplifier with active loads, Basic information about op-amps – Ideal Operational Amplifier - General operational amplifier stages -and internal circuit diagrams of IC 741, DC and AC performance characteristics, slew rate, Open and closed loop configurations.

UNIT II APPLICATIONS OF OPERATIONAL AMPLIFIERS 9

Sign Changer, Scale Changer, Phase Shift Circuits, Voltage Follower, V-to-I and I-to-V converters, adder, subtractor, Instrumentation amplifier, Integrator, Differentiator, Logarithmic amplifier, Antilogarithmic amplifier, Comparators, Schmitt trigger, Precision rectifier, peak detector, clipper and clamper, Low-pass, high-pass and band-pass Butterworth filters.

UNIT III ANALOG MULTIPLIER AND PLL 9

Analog Multiplier using Emitter Coupled Transistor Pair - Gilbert Multiplier cell – Variable transconductance technique, analog multiplier ICs and their applications, Operation of the basic PLL, Closed loop analysis, Voltage controlled oscillator, Monolithic PLL IC 565, application of PLL for AM detection, FM detection, FSK modulation and demodulation and Frequency synthesizing.

.UNIT IVANALOG TO DIGITAL AND DIGITAL TO ANALOG CONVERTERS 9

Analog and Digital Data Conversions, D/A converter – specifications - weighted resistor type, R-2R Ladder type, Voltage Mode and Current-Mode *R 2R* Ladder types - switches for D/A converters, high speed sample-and-hold circuits, A/D Converters – specifications - Flash type - Successive Approximation type - Single Slope type – Dual Slope type - A/D Converter using Voltage-to-Time Conversion - Over-sampling A/D Converters.

UNIT VWAVEFORM GENERATORS AND SPECIAL FUNCTION ICS 9

Sine-wave generators, Multivibrators and Triangular wave generator, Saw-tooth wave generator, ICL8038 function generator, Timer IC 555, IC Voltage regulators – Three terminal fixed and adjustable voltage regulators - IC 723 general purpose regulator - Monolithic switching regulator, Switched capacitor filter IC MF10, Frequency to Voltage and Voltage to Frequency converters, Audio Power amplifier, Video Amplifier, Isolation Amplifier, Opto-couplers and fibre optic IC.

TOTAL: 45 PERIODS

Content beyond Syllabus:	Operational transconductional amplifier. Tri state logic NMOS logic.
Text Books	Sergio Franco, Design with operational amplifiers and analog integrated circuits, 3rd Edition, Tata McGraw-Hill, 2007. D.Roy Choudhry, Shail Jain, Linear Integrated Circuits, New Age International Pvt.Lt
Reference Books	1. B.S.Sonde, System design using Integrated Circuits , New Age Pub, 2nd Edition, 2001 2. Gray and Meyer, Analysis and Design of Analog Integrated Circuits, Wiley International, 2005. 3. Ramakant A.Gayakwad, OP-AMP and Linear ICs, Prentice Hall / Pearson Education,4th Edition, 2001. 4. J.Michael Jacob, Applications and Design with Analog Integrated Circuits, Prentice Hall of India, 1996. 5. William D.Stanley, Operational Amplifiers with Linear Integrated Circuits, Pearson Education, 2004. 6. K Lal Kishore, Operational Amplifier and Linear Integrated Circuits, Pearson Education, 2006. 7. 7. S.Salivahanan & V.S. Kanchana Bhaskaran, Linear Integrated Circuits, TMH, 2008.
Website:	www.nptel.iitm.ac.in ocw.mit.edu
ONLINE RESOURCES	PPT Presentation. Online Objective Questions. Videos Materials if any (You tube).

EC6405 **CONTROL SYSTEM ENGINEERING** **L T P C**
3 0 0 3

PREREQUISITE:	signals and system											
COURSE OBJECTIVES:	To understand the open loop and closed loop (feedback) systems. To understand time domain and frequency domain analysis of control systems required for stability analysis. To understand the compensation technique that can be used to stabilize control systems.											
COURSE OUTCOMES	CO1	Perform time domain analysis of control systems required for stability analysis.										
	CO2	Analyze frequency domain analysis of control systems required for stability analysis.										
	CO3	Design the compensation technique that can be used to stabilize control systems.										
	CO4	Explain the elements of control system and their modeling using various Techniques.										
	CO5	Categorize the time response, the frequency response and the stability of systems										
CO – PO MAPPING	Course Outcomes	Program Outcome										
		1	2	3	4	5	6	7	8	9	10	11	12
	CO1	3	3										
	CO2	3	3										
	CO3	3		3									
	CO4	3			2	2							
	CO5	3	3										

UNIT I CONTROL SYSTEM MODELING 9

Basic Elements of Control System – Open loop and Closed loop systems - Differential equation - Transfer function, Modeling of Electric systems, Translational and rotational mechanical systems - Block diagram reduction Techniques - Signal flow graph

UNIT IITIME RESPONSE ANALYSIS 9

Time response analysis - First Order Systems - Impulse and Step Response analysis of second order systems - Steady state errors – P, PI, PD and PID Compensation, Analysis using MATLAB

UNIT IIIFREQUENCY RESPONSE ANALYSIS 9

Frequency Response - Bode Plot, Polar Plot, Nyquist Plot - Frequency Domain specifications from the plots - Constant M and N Circles - Nichol‟s Chart - Use of Nichol‟s Chart in Control System Analysis.

Series, Parallel, series-parallel Compensators - Lead, Lag, and Lead Lag Compensators, Analysis using MATLAB.

UNIT IV STABILITY ANALYSIS 9

Stability, Routh-Hurwitz Criterion, Root Locus Technique, Construction of Root Locus, Stability, Dominant Poles, Application of Root Locus Diagram - Nyquist Stability Criterion - Relative Stability, Analysis using MATLAB

UNIT V STATE VARIABLE ANALYSIS 9

State space representation of Continuous Time systems – State equations – Transfer function from State Variable Representation – Solutions of the state equations - Concepts of Controllability and Observability – State space representation for Discrete time systems. Sampled Data control systems
– Sampling Theorem – Sampler & Hold – Open loop & Closed loop sampled data systems.

TOTAL: 45 PERIODS

Content beyond Syllabus:	Design of lag, lead & lag-lead compensator using root locus technique.
Text Books	1. J.Nagrath and M.Gopal," Control System Engineering", New Age International Publishers, 5th Edition, 2007. 2. M.Gopal, "Control System – Principles and Design", Tata McGraw Hill, 2nd Edition
Reference Books	Benjamin.C.Kuo, "Automatic control systems", Prentice Hall of India, 7th Edition,1995. M.Gopal, Digital Control and State Variable Methods, 2nd Edition, TMH, 2007. Schaum's Outline Series,'Feedback and Control Systems' Tata McGraw- Hill, 2007. John J.D'azzo & Constantine H.Houpis, 'Linear control system analysis and design', Tata McGrow-Hill, Inc., 1995. 4. Richard C. Dorf & Robert H. Bishop, " Modern Control Systems", Addidon – Wesley,1999.
Website:	www.nptel.iitm.ac.in ocw.mit.edu
ONLINE RESOURCES	PPT Presentation. Online Objective Questions. Videos Materials if any (You tube).

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EC6411 CIRCUITS AND SIMULATION INTEGRATED LABORATORY L T P C
0 0 3 2

PREREQUISITE:	Electronics Circuits II & electronic circuits lab-I												
COURSE OBJECTIVES:	To Design and construct amplifies, oscillators, tuned amplifier, wave shapping circuits and multivibrators.												
COURSE OUTCOMES	CO1	Analyze various types of feedback amplifiers.											
	CO2	Design oscillators, tuned amplifiers, and multivibrators.											
	CO3	Demonstrate the various types of blocking oscillators.											
	CO4	Simulate,Oscillators,tuned amplifiers, wave-shaping circuits and multivibrators using SPICE Tool.											
	CO5	Perform voltage and current time base circuits using PSPICE Tool.											
CO – PO MAPPING	Course Outcomes	Program Outcome											
		1	2	3	4	5	6	7	8	9	10	11	12
	CO1		3	2		2							
	CO2		3	2		2							
	CO3		3	2		2							
	CO4		3	2		2							
	CO5		3	2		2							

DESIGN AND ANALYSIS OF THE FOLLOWING CIRCUITS

1. Series and Shunt feedback amplifiers-Frequency response, Input and output impedance calculation
2. RC Phase shift oscillator and Wien Bridge Oscillator
3. Hartley Oscillator and Colpitts Oscillator
4. Single Tuned Amplifier
5. RC Integrator and Differentiator circuits
6. Astable and Monostable multivibrators
7. Clippers and Clampers
8. Free running Blocking Oscillators

SIMULATION USING SPICE (Using Transistor):

1. Tuned Collector Oscillator
2. Twin -T Oscillator / Wein Bridge Oscillator
3. Double and Stagger tuned Amplifiers
4. Bistable Multivibrator
5. Schmitt Trigger circuit with Predictable hysteresis
6. Monostable multivibrator with emitter timing and base timing
7. Voltage and Current Time base circuits

TOTAL: 45 PERIODS

Content beyond Syllabus:	Design of Differential amplifier using BJT
Text Books	-
Reference Books	Millman J. and Taub H., Pulse Digital and Switching Waveforms, TMH, 2000.Schilling and Belove, Electronic Circuits, 3rd Edition, TMH, 2002. Robert L. Boylestad and Louis Nasheresky, Electronic Devices and Circuit Theory, 9thEdition, Pearson Education / PHI, 2002. David A. Bell, Solid State Pulse Circuits, Prentice Hall of India, 1992. Millman and Halkias. C., Integrated Electronics, TMH, 1991.
Website:	www.nptel.iitm.ac.in ocw.mit.edu

ONLINE RESOURCES	PPT Presentation. Online Objective Questions. Videos Materials if any (You tube).

EC6412 LINEAR INTEGRATED CIRCUITS LABORATORY L T P C
0 0 3 2

PREREQUISITE:	Linear Integrated Circuits & electronic circuits -I												
COURSE OBJECTIVES:	To study the IC fabrication procedure. To study characteristics; realize circuits; design for signal analysis using Op-amp ICs. To study the applications of Op-amp. To study internal functional blocks and the applications of special ICs like Timers, PLL circuits, regulator Circuits, ADCs.												
COURSE OUTCOMES	CO1	Design oscillators and amplifiers using operational amplifiers.											
	CO2	Experiment with filters using Opamp and perform experiment on frequency response.											
	CO3	Analyze the working of PLL and use PLL as frequency multiplier.											
	CO4	Build DC power supply using ICs.											
	CO5	Design the performance of oscillators and multivibrators using SPICE											
CO – PO MAPPING	Course Outcomes	Program Outcome											
		1	2	3	4	5	6	7	8	9	10	11	12
	CO1		3	3		2							
	CO2		3	3		2							
	CO3		3	3		2							
	CO4		3	3		2							
	CO5		3	3		2							

LIST OF EXPERIMENTS:
DESIGN AND TESTING OF

1. Inverting, Non inverting and Differential amplifiers.
2. Integrator and Differentiator.
3. Instrumentation amplifier
4. Active low-pass, High-pass and band-pass filters.
5. Astable & Monostable multivibrators and Schmitt Trigger using op-amp.
6. Phase shift and Wien bridge oscillators using op-amp.
7. Astable and monostable multivibrators using NE555 Timer.
8. PLL characteristics and its use as Frequency Multiplier.
9. DC power supply using LM317 and LM723.
10. Study of SMPS.

SIMULATION USING SPICE

1. Simulation of Experiments 3, 4, 5, 6 and 7.
2. D/A and A/D converters (Successive approximation)
3. Analog multiplier
4. CMOS Inverter, NAND and NOR

TOTAL: 45 PERIODS

Content beyond Syllabus:	Bistable multivibrator using op-amp
Text Books	
Reference Books	Jacob Millman, Christos C.Halkias, 'Integrated Electronics - Analog and Digital circuits system', Tata McGraw Hill, 2003. Robert F.Coughlin, Fredrick F.Driscoll, 'Op-amp and Linear ICs', Pearson Education, 4th edition, 2002 / PHI. David A.Bell, 'Op-amp & Linear ICs', Prentice Hall of India, 2nd edition, 1997
Website:	www.nptel.iitm.ac.in ocw.mit.edu
ONLINE RESOURCES	PPT Presentation. Online Objective Questions. Videos Materials if any (You tube).

EE6461 ELECTRICAL ENGINEERING AND CONTROL SYSTEM LABORATORY L T P C
0 0 3 2

PREREQUISITE:	Electrical Engineering & Control Systems												
COURSE OBJECTIVES:	To understand the methods of representation of systems and to desire their transfer function models. To provide adequate knowledge in the time response of systems and steady state error analysis. To accord basic knowledge in obtaining the open loop and closed–loop frequency responses of systems. To understand the concept of stability of control system and methods of stability analysis. To study the three ways of designing compensation for a control system.												
COURSE OUTCOMES	CO1	Perform experiments to study the load characteristics of DC motors / generators.											
	CO2	Design bridge network circuit to measure the values of passive component.											
	CO3	Analyze the stability of linear system through simulation software.											
	CO4	Design transfer function of DC generators.											
	CO5	Estimate the effect of P, PI, PID controllers using MATLAB or equivalent Software.											
CO – PO MAPPING	Course Outcomes	Program Outcome											
		1	2	3	4	5	6	7	8	9	10	11	12
	CO1	3											
	CO2			3									
	CO3		3		2								
	CO4			3	2								
	CO5			3	2	2							

LIST OF EXPERIMENTS:

1. Study of DC & AC motor starters
2. Study of three phase circuits
3. Speed Control of DC shunt motor
4. Load Test on DC shunt motor
5. OCC & Load Characteristics of DC shunt generator

6. Transfer Function of separately excited D.C. Generator
7. Regulation of three phase alternator
8. Open Circuit and Short Circuit test on single phase transformer to draw its equivalent circuit
9. Load test on single-phase transformer
10. Load test on single phase and three-phase Induction motor
11. Measurement of passive elements using Bridge Networks.
12. Study of transducers and characterization.
13. Digital simulation of linear systems.
14. Stability Analysis of Linear system using MATLAB or equivalent Software.
15. Study the effect of P, PI, PID controllers using MATLAB or equivalent Software.
16. Design of Lead and Lag compensator.

Content beyond Syllabus:	Design P, PI, and PID controllers. Determination of transfer functions of self excited dc generator.
Text Books	
Reference Books	K. Ogata, 'Modern Control Engineering', 4th edition, PHI, New Delhi, 2002. Norman S. Nise, Control Systems Engineering, 4th Edition, John Wiley, New Delhi, 2007. Samarajit Ghosh, Control systems, Pearson Education, New Delhi, 2004 M. Gopal, 'Control Systems, Principles and Design', Tata McGraw Hill, New Delhi, 2002
Website:	www.nptel.iitm.ac.in ocw.mit.edu
ONLINE RESOURCES	PPT Presentation. Online Objective Questions. Videos Materials if any (You tube).

Semester V

EC6501 **DIGITAL COMMUNICATION** **L T P C**

3 0 0 3

PREREQUISITE:	Communication theory	
COURSE OBJECTIVES:	• To know the principles of sampling and Quantization • To study the various waveform coding schemes • To learn the various baseband transmission schemes • To understand the various band pass signaling schemes • To know the fundamentals of channel coding.	
COURSE OUTCOMES	CO1	Understand the principles of Sampling and Quantization.
	CO2	.Design and implement base band transmission schemes
	CO3	Design and implement band pass signaling schemes.
	CO4	Analyze the spectral characteristics of band pass signaling schemes and their noise performance.
	CO5	Design an Error control coding scheme

	COURSE OUTCOMES	PROGRAM OUTCOME											
		1	2	3	4	5	6	7	8	9	10	11	12
CO – PO MAPPING	CO1	3		3									
	CO2	3				3							
	CO3		3	3									
	CO4		3	2	2								
	CO5		3	2									

UNIT I SAMPLING & QUANTIZATION 9

Low pass sampling – Aliasing- Signal Reconstruction-Quantization - Uniform & non-uniform quantization - quantization noise - Logarithmic Companding of speech signal- PCM - TDM

UNIT II WAVEFORM CODING 9

Prediction filtering and DPCM - Delta Modulation - ADPCM & ADM principles-Linear Predictive Coding

UNIT III BASEBAND TRANSMISSION 9

Properties of Line codes- Power Spectral Density of Unipolar / Polar RZ & NRZ – Bipolar NRZ - Manchester- ISI – Nyquist criterion for distortionless transmission – Pulse shaping – Correlative coding - Mary schemes – Eye pattern - Equalization

UNIT IV DIGITAL MODULATION SCHEME 9

Geometric Representation of signals - Generation, detection, PSD & BER of Coherent BPSK, BFSK & QPSK - QAM - Carrier Synchronization - structure of Non-coherent Receivers - Principle of DPSK.

UNIT V ERROR CONTROL CODING 9

Channel coding theorem - Linear Block codes - Hamming codes - Cyclic codes - Convolutional codes - Vitterbi Decoder

TOTAL: 45 PERIODS

Content beyond Syllabus:	1.Hybrid Modulation
Text Books	Amitabha Bhattacharya, "Digital Communications", Tata McGraw Hill, 2006. Simon Haykin, "Digital Communications", John Wiley, 2006.
Reference Books	John.G. Proakis, "Fundamentals of Communication Systems", Pearson Education,2006. Michael. B. Purrsley, "Introduction to Digital Communication", Pearson Education,2006. Bernard Sklar, Digital Communication, 2nd Edition, Paerson Education, 2006 Herbert Taub & Donald L Schilling – Principles of Communication Systems (3rdEdition) – Tata McGraw Hill, 2008. 16. Leon W. Couch, Digital and Analog Communication Systems, 6th Edition, Pearson Education, 2001.
Website:	www.nptel.iitm.ac.in ocw.mit.edu
ONLINE RESOURCES	PPT Presentation Online Objective Questions Videos Materials if any (You tube)

EC6502 PRINCIPLES OF DIGITAL SIGNAL PROCESSING L T P C

3 1 0 4

PREREQUISITE:	Signals and systems												
COURSE OBJECTIVES:	1. To study DFT and its computation 2. To study the design techniques for digital filters 3. To study the finite word length effects in signal processing 4. To study the non-parametric methods of power spectrum estimations 5. To study the fundamentals of digital signal processors												
COURSE OUTCOMES	CO1	Explain the fourier transform for various application such as image processing and speech analysis which form the basis of signal processing.											
	CO2	Analyze the IIR filter structure											
	CO3	Deduct the sampling methods and FIR structure effectively in signal processing methodologies.											
	CO4	Solve the finite word length effects in quantization noise and round off errors.											
	CO5	Design a FIR and narrow band filter circuit in multirate signal processing.											
CO – PO MAPPING	COURSE OUTCOMES	PROGRAM OUTCOME											
		1	2	3	4	5	6	7	8	9	10	11	12
	CO1	2	3	3									
	CO2		3	3		2							
	CO3		2	2	3	2							
	CO4	3	3		2								
	CO5		2	3		2							

UNIT I DISCRETE FOURIER TRANSFORM 9

Discrete Signals and Systems- A Review – Introduction to DFT – Properties of DFT – Circular Convolution - Filtering methods based on DFT – FFT Algorithms –Decimation in time Algorithms, Decimation in frequency Algorithms – Use of FFT in Linear Filtering.

UNIT II IIR FILTER DESIGN 9

Structures of IIR – Analog filter design – Discrete time IIR filter from analog filter – IIR filter design by Impulse Invariance, Bilinear transformation, Approximation of derivatives – (LPF, HPF, BPF, BRF) filter design using frequency translation.

UNIT III FIR FILTER DESIGN 9

Structures of FIR – Linear phase FIR filter – Fourier Series - Filter design using windowing techniques (Rectangular Window, Hamming Window, Hanning Window), Frequency sampling techniques – Finite word length effects in digital Filters: Errors, Limit Cycle, Noise Power Spectrum.

UNIT IV FINITE WORDLENGTH EFFECTS 9

Fixed point and floating point number representations – ADC –Quantization- Truncation and Rounding errors - Quantization noise – coefficient quantization error – Product quantization error - Overflow error – Roundoff noise power - limit cycle oscillations due to product round off and overflow errors – Principle of scaling

UNIT VDSP APPLICATIONS 9

Multirate signal processing: Decimation, Interpolation, Sampling rate conversion by a rational factor – Adaptive Filters: Introduction, Applications of adaptive filtering to equalization.

TOTAL (L:45+T:15): 60 PERIODS

Content beyond Syllabus:	Adaptive Equalizer
Text Books	1. John G Proakis and Manolakis, " Digital Signal Processing Principles, Algorithms and Applications", Pearson, Fourth Edition, 2007. 2. S.Salivahanan, A. Vallavaraj, C. Gnanapriya, Digital Signal Processing, TMH/McGraw Hill International, 2007
Reference Books	1. E.C. Ifeachor and B.W. Jervis, " Digital signal processing – A practicalapproach",Second edition, Pearson, 2002. 2. S.K. Mitra, Digital Signal Processing, A Computer Based approach, Tata Mc GrawHill, 1998.
Website:	www.nptel.iitm.ac.in ocw.mit.edu
ONLINE RESOURCES	PPT Presentation Online Objective Questions Videos Materials if any (You tube)

EC6503 TRANSMISSION LINES AND WAVE GUIDES L T P C
3 1 0 4

PREREQUISITE:	Electro Magnetic fields												
COURSE OBJECTIVES:	1. To become familiar with propagation of signals through lines 2. Understand signal propagation at Radio frequencies 3. Understand radio propagation in guided systems 4. To become familiar with resonators												
COURSE OUTCOMES	CO1	Interpret various types of filters and have the knowledge regarding electromagnetic wave propagation and its characteristics.											
	CO2	Compare and classify the various transmission line parameters and circuits.											
	CO3	Explain the simple matching network using lumped element, quarter wave section and stub tuners.											
	CO4	Apply the vector calculus to understand the behaviour of TE&TM waves and evaluate its performance.											
	CO5	Justify and verify the circuit related to the cut off frequency, group& phase velocity, and guided wavelength of each waveguide.											
CO – PO MAPPING	COURSE OUTCOMES	PROGRAM OUTCOME											
		1	2	3	4	5	6	7	8	9	10	11	12
	CO1	3	2	2									
	CO2		3										
	CO3		2	3									
	CO4	3				2							
	CO5		3	2									

UNIT I TRANSMISSION LINE THEORY 9

General theory of Transmission lines - the transmission line - general solution - The infinite line - Wavelength, velocity of propagation - Waveform distortion - the distortion-less line - Loading and different methods of

loading - Line not terminated in Z_0 - Reflection coefficient - calculation of current, voltage, power delivered and efficiency of transmission - Input and transfer impedance - Open and short circuited lines - reflection factor and reflection loss.

UNIT II HIGH FREQUENCY TRANSMISSION LINES 9

Transmission line equations at radio frequencies - Line of Zero dissipation - Voltage and current on the dissipation-less line, Standing Waves, Nodes, Standing Wave Ratio - Input impedance of the dissipation-less line - Open and short circuited lines - Power and impedance measurement on lines - Reflection losses - Measurement of VSWR and wavelength.

UNIT IIIIMPEDANCE MATCHING IN HIGH FREQUENCY LINES 9

Impedance matching: Quarter wave transformer - Impedance matching by stubs - Single stub and double stub matching - Smith chart - Solutions of problems using Smith chart - Single and double stub matching using Smith chart.

UNIT IV PASSIVE FILTERS 9

Characteristic impedance of symmetrical networks - filter fundamentals, Design of filters: Constant K - Low Pass, High Pass, Band Pass, Band Elimination, m- derived sections - low pass, high pass composite filters.

UNIT VWAVE GUIDES AND CAVITY RESONATORS 9

General Wave behaviours along uniform Guiding structures, Transverse Electromagnetic waves, Transverse Magnetic waves, Transverse Electric waves, TM and TE waves between parallel plates, TM and TE waves in Rectangular wave guides, Bessel's differential equation and Bessel function, TM and TE waves in Circular wave guides, Rectangular and circular cavity Resonators.

Content beyond Syllabus:	Design Of Passive Attenuator
Text Books	3. John D.Ryder, "Networks, lines and fields", Prentice Hall of India, 2nd Edition, 2006.
Reference Books	1. E.C.Jordan, K.G. Balmain: "E.M.Waves & Radiating Systems", Pearson Education,2006. 2. Joseph Edminister, Schaum's Series, Electromegnetics, TMH, 2007. 3. G S N Raju, Electromagnetic Field Theory and Transmission Lines, Pearson Education, 2006.
Website:	www.nptel.iitm.ac.in ocw.mit.edu
ONLINE RESOURCES	PPT Presentation Online Objective Questions Videos Materials if any (You tube)

GE6351 ENVIRONMENTAL SCIENCE AND ENGINEERING L T P C

3 0 0 3

PREREQUISITE:	Engineering chemistry-II												
COURSE OBJECTIVES:	1. At the end of this course the student is expected to understand what constitutes the environment, what are precious resources in the environment, how to conserve these resources, what is the role of a human bein in maintaining a clean environment and useful environment for the future generations and how to maintain ecological balance and preserve bio-diversity.												
COURSE OUTCOMES	CO1	Develop an healthy environment for future generation											
	CO2	Summarize the impact of engineering solutions in global and social context.											
	CO3	Describe contemporary issues that results in environmental degradation and would attempt to provide solution to overcome those problem.											
	CO4	Discover the issues of environment and sustainable development in his personal and professional undertakings.											
	CO5	Formulate the importance of conservation of resources.											
CO – PO MAPPING	COURSE OUTCOMES	PROGRAM OUTCOME											
		1	2	3	4	5	6	7	8	9	10	11	12
	CO1							3					
	CO2						3					3	
	CO3						3	3				2	
	CO4						3	3			2		
	CO5						3	2					2

UNIT I ENVIRONMENT, ECOSYSTEMS AND BIODIVERSITY 12

Definition, scope and importance of Risk and hazards; Chemical hazards, Physical hazards, Biological hazards in the environment – concept of an ecosystem – structure and function of an ecosystem – producers, consumers and decomposers-Oxygen cycle and Nitrogen cycle – energy flow in the ecosystem – ecological succession processes – Introduction, types, characteristic features, structure and function of the (a) forest ecosystem (b) grassland ecosystem (c) desert ecosystem (d) aquatic ecosystems (ponds, streams, lakes, rivers, oceans, estuaries) – Introduction to biodiversity definition: genetic, species and ecosystem diversity – biogeographical classification of India – value of biodiversity: consumptive use, productive use, social, ethical, aesthetic and option values – Biodiversity at global, national and local levels – India as a mega-diversity nation – hot-spots of biodiversity – threats to biodiversity: habitat loss, poaching of wildlife, man-wildlife conflicts – endangered and endemic species of India – conservation of biodiversity: In-situ and ex-situ conservation of biodiversity. Field study of common plants, insects, birds

Field study of simple ecosystems – pond, river, hill slopes, etc.

UNIT II ENVIRONMENTAL POLLUTION 10

Definition – causes, effects and control measures of: (a) Air pollution (Atmospheric chemistry-Chemical composition of the atmosphere; Chemical and photochemical reactions in the atmosphere - formation of smog, PAN, acid rain, oxygen and ozone chemistry;- Mitigation procedures- Control of particulate and gaseous emission, Control of SO_2, NO_X, CO and HC) (b) Water pollution : Physical and chemical properties of terrestrial and marine water and their environmental significance; Water quality parameters – physical, chemical and biological; absorption of heavy metals - Water treatment processes. (c) Soil pollution - soil waste management: causes, effects and control measures of municipal solid wastes – (d) Marine pollution (e) Noise pollution (f) Thermal pollution (g) Nuclear hazards–role of an individual in prevention of pollution – pollution case studies – Field study of local polluted site – Urban / Rural / Industrial / Agricultural.

UNIT III NATURAL RESOURCES 10

Forest resources: Use and over-exploitation, deforestation, case studies- timber extraction, mining, dams and their effects on forests and tribal people – Water resources: Use and overutilization of surface and ground water, dams-benefits and problems – Mineral resources: Use and exploitation, environmental effects of extracting and using mineral resources, case studies – Food resources: World food problems, changes caused by agriculture and overgrazing, effects of modern agriculture, fertilizer-pesticide problems, water logging, salinity, case studies – Energy resources: Growing energy needs, renewable and non renewable energy sources, use of alternate energy sources. Energy Conversion processes – Biogas – production and uses, anaerobic digestion; case studies – Land resources: Land as a resource, land degradation, man induced landslides, soil erosion and desertification – role of an individual in conservation of natural resources – Equitable use of resources for sustainable lifestyles. Introduction to Environmental Biochemistry: Proteins –Biochemical degradation of pollutants, Bioconversion of pollutants.Field study of local area to document environmental assets – river/forest/grassland/hill/mountain.

UNIT IV SOCIAL ISSUES AND THE ENVIRONMENT 7

From unsustainable to sustainable development – urban problems related to energy – water conservation, rain water harvesting, watershed management – resettlement and rehabilitation of people; its problems and concerns, case studies – role of non-governmental organization-environmental ethics: Issues and possible solutions – 12 Principles of green chemistry- nuclear accidents and holocaust, case studies. – wasteland reclamation – consumerism and waste products – environment production act – Air act – Water act – Wildlife protection act – Forest conservation act – The Biomedical Waste (Management and Handling) Rules; 1998 and amendments-scheme of labeling of environmentally friendly products (Ecomark). enforcement machinery involved in environmental legislation- central and state pollution control boards- disaster management: floods, earthquake, cyclone and landslides. Public awareness

UNIT V HUMAN POPULATION AND THE ENVIRONMENT 6

Population growth, variation among nations – population explosion – family welfare programme – environment and human health – human rights – value education – HIV / AIDS – women and child welfare –Environmental impact analysis (EIA)- -GIS-remote sensing-role of information technology in environment and human health – Case studies.

TOTAL: 45 PERIODS

Content beyond Syllabus:	Softwares for environment education Remote sensing Datebase Geograthical Information System
Text Books	S.K.Bhattacharya, 'Electrical Machines', Tata McGraw Hill Publishing company ltd, second edition, 2007. V.K.Mehta and Rohit Mehta, 'Principles of Power System', S.Chand and CompanyLtd, second edition, 2006
Reference Books	D.P.Kothari and I.J.Nagrath, 'Basic Electrical Engineering', Tata McGraw Hill publishing company ltd, second edition, 2007 (Reprint). C.L. Wadhwa, 'Electrical Power Systems', New Age International, fourth edition, 2007.
Website:	www.nptel.iitm.ac.in ocw.mit.edu
ONLINE RESOURCES	PPT Presentation Online Objective Questions Videos Materials if any (You tube)

EC6504 **MICROPROCESSOR AND MICROCONTROLLER** **L T P C**
3 0 0 3

PREREQUISITE:	Digital Electronics												
COURSE OBJECTIVES:	1. To introduce microprocessors and basics of system design using microprocessors. 2. To introduce h/w architecture, instruction set and programming of 8086 microprocessor. 3 To introduce the peripheral interfacing of microprocessors 4. To introduce microcontrollers and basics of system design using microcontroller. 5. To introduce through case studies, the system design principles using 8051.												
COURSE OUTCOMES	CO1	Create the detailed schematics about microprocessor architecture.											
	CO2	Apply the program in microprocessor using assembly language program.											
	CO3	Demonstrate the interfacing circuit in real system.											
	CO4	Demonstrate the hardware architecture of 8051 microcontroller											
	CO5	Construct any system operation based on the knowledge using system design using microcontroller.											
CO – PO MAPPING	COURSE OUTCOMES	PROGRAM OUTCOME											
		1	2	3	4	5	6	7	8	9	10	11	12
	CO1	3	2	2									
	CO2		3	2	3	3							
	CO3			3	2								
	CO4	3	2	2									
	CO5			3	2	3						3	

UNIT I THE 8086 MICROPROCESSOR **9**

Introduction to 8086 – Microprocessor architecture – Addressing modes - Instruction set and assembler directives – Assembly language programming – Modular Programming - Linking and Relocation - Stacks - Procedures – Macros – Interrupts and interrupt service routines – Byte and String Manipulation.

UNIT II 8086 SYSTEM BUS STRUCTURE **9**

8086 signals – Basic configurations – System bus timing –System design using 8086 – IO programming – Introduction to Multiprogramming – System Bus Structure - Multiprocessor configurations – Coprocessor, Closely coupled and loosely Coupled configurations – Introduction to advanced processors.

UNIT III I/O INTERFACING **9**

Memory Interfacing and I/O interfacing - Parallel communication interface – Serial communication interface – D/A and A/D Interface - Timer – Keyboard /display controller – Interrupt controller – DMA controller – Programming and applications Case studies: Traffic Light control, LED display , LCD display, Keyboard display interface and Alarm Controller.

UNIT IV MICROCONTROLLER **9**

Architecture of 8051 – Special Function Registers(SFRs) - I/O Pins Ports and Circuits - Instruction set - Addressing modes - Assembly language programming.

UNIT V INTERFACING MICROCONTROLLER **9**

Programming 8051 Timers - Serial Port Programming - Interrupts Programming – LCD & Keyboard Interfacing - ADC, DAC & Sensor Interfacing - External Memory Interface- Stepper Motor and Waveform generation

TOTAL: 45 PERIODS

Content beyond Syllabus:	ARM Processor
Text Books	1. Krishna Kant, "MICROPROCESSORS AND MICROCONTROLLERS Architecture,programming and system design using 8085, 8086, 8051 and 8096". PHI 2007. 2. Douglas V Hall, "MICROPROCESSORS AND INTERFACING, PROGRAMMING AND HARDWARE" TMH, 2006.Delhi, 2002.
Reference Books	1. Muhammad Ali Mazidi, Janice Gillispie Mazidi, Rolin D.MCKinlay The 8051Microcontroller and Embedded Systems, Second Edition, Pearson Education 2008. 2. Kenneth J. Ayala, "The 8086 Microprocessor: Programming & Interfacing The PC",Delmar Publishers, 2007. 3. A K Ray, K M Bhurchandi, Advanced Microprocessors and Peripherals, TMH, 2007
Website:	www.nptel.iitm.ac.in ocw.mit.edu
ONLINE RESOURCES	PPT Presentation Online Objective Questions Videos Materials if any (You tube)

EC6511 DIGITAL SIGNAL PROCESSING LABORATORY L T P C

0 0 3 2

PREREQUISITE:	DSP												
COURSE OBJECTIVES:	1.To implement the processing techniques using the instructions of TMS320C5X/TMS320C 67XX/ADSP 218X/219X/BS531/532/561 2. To implement the IIR and FIR filter using MATLAB												
COURSE OUTCOMES	CO1	Design the various types of continuous signal and discrete signal.											
	CO2	Demonstrate their abilities towards DSP processor based implementation of DSP system.											
	CO3	Calculate and analyze the continuous and discrete signals using FFT algorithm.											
	CO4	Analyze Finite word length effect on DSP systems.											
	CO5	Implement adaptive filters for various applications of DSP.											
CO – PO MAPPING	COURSE OUTCOMES	PROGRAM OUTCOME											
		1	2	3	4	5	6	7	8	9	10	11	12
	CO1		2	3		2						2	
	CO2		2	3		2						2	
	CO3		3	2		2						2	
	CO4		3			2						2	
	CO5		2	3		2						2	

LIST OF EXPERIMENTS:

MATLAB / EQUIVALENT SOFTWARE PACKAGE

1. Generation of sequences (functional & random) & correlation
2. Linear and Circular Convolutions
3. Spectrum Analysis using DFT

4. FIR filter design
5. IIR filter design
6. Multirate Filters
7. Equalization

DSP PROCESSOR BASED IMPLEMENTATION

8. Study of architecture of Digital Signal Processor
9. MAC operation using various addressing modes
10. Linear Convolution
11. Circular Convolution
12. FFT Implementation
13. Waveform generation
14. IIR and FIR Implementation
15. Finite Word Length Effect

Content beyond Syllabus:	1.Implementation of FIR filter Using Tms320c5x/Tms320c 67xx/Adsp 218x/219x/Bs531/532/561
Text Books	
Reference Books	1. E.C. Ifeachor and B.W. Jervis, " Digital signal processing – A practicalapproach",Second edition, Pearson, 2002. 2. S.K. Mitra, Digital Signal Processing, A Computer Based approach, Tata Mc GrawHill, 1998. 3. P.P.Vaidyanathan, Multirate Systems & Filter Banks, Prentice Hall, Englewood cliffs, NJ, 1993. 4. Johny R. Johnson, Introduction to Digital Signal Processing, PHI, 2006
Website:	www.nptel.iitm.ac.in ocw.mit.edu
ONLINE RESOURCES	PPT Presentation Online Objective Questions Videos Materials if any (You tube)

TOTAL: 45 PERIODS

EC6512 COMMUNICATION SYSTEMS LABORATORY L T P C
0 0 3 2

PREREQUISITE:	Digital Communication & linear integrated circuits laboratory												
COURSE OBJECTIVES:	1. To construct and study various analog and digital modulation techniques												
COURSE OUTCOMES	CO1	Design the various types of continuous signal and discrete signal.											
	CO2	Demonstrate their abilities towards DSP processor based implementation of DSP system.											
	CO3	Calculate and analyze the continuous and discrete signals using FFT algorithm.											
	CO4	Analyze Finite word length effect on DSP systems.											
	CO5	Implement adaptive filters for various applications of DSP.											
CO – PO MAPPING	COURSE OUTCOMES	PROGRAM OUTCOME											
		1	2	3	4	5	6	7	8	9	10	11	12
	CO1		2	3	2							2	
	CO2			3	2	2						2	
	CO3		3	3								2	

	CO4		2			3						2	
	CO5		2	3								2	

LIST OF EXPERIMENTS:

1. Signal Sampling and reconstruction
2. Time Division Multiplexing
3. AM Modulator and Demodulator
4. FM Modulator and Demodulator
5. Pulse Code Modulation and Demodulation
6. Delta Modulation and Demodulation
7. Observation (simulation) of signal constellations of BPSK, QPSK and QAM
8. Line coding schemes
9. FSK, PSK and DPSK schemes (Simulation)
10. Error control coding schemes - Linear Block Codes (Simulation)
11. Communication link simulation
12. Equalization – Zero Forcing & LMS algorithms(simulation)

TOTAL: 45 PERIODS

Content beyond Syllabus:	Digital link using fiber
Text Books	
Reference Books	John.G. Proakis, "Fundamentals of Communication Systems", Pearson Education,2006. Michael. B. Purrsley, "Introduction to Digital Communication", Pearson Education,2006. Bernard Sklar, Digital Communication, 2nd Edition, Paerson Education, 2006 Herbert Taub & Donald L Schilling – Principles of Communication Systems (3rdEdition) – Tata McGraw Hill, 2008. Leon W. Couch, Digital and Analog Communication Systems, 6th Edition, Pearson Education, 2001.
Website:	www.nptel.iitm.ac.in ocw.mit.edu
ONLINE RESOURCES	PPT Presentation Online Objective Questions Videos Materials if any (You tube)

EC6513 MICROPROCESSOR AND MICROCONTROLLER LABORATORY L T P C
0 0 3 2

PREREQUISITE:	Digital Electronics Lab												
COURSE OBJECTIVES:	To understand programming of microprocessors & microcontroller												
COURSE OUTCOMES	CO1	Demonstrate and apply working of programs in 8086 microprocessor and 8051 microcontroller.											
	CO2	Explain various assembly language programs.											
	CO3	Develop the basic knowledge of microprocessor and microcontroller interfacing and their application.											
	CO4	Design the system using capabilities of stack program counter and status register and show how these are used to execute a machine code program.											
	CO5	Justify the programming proficiency using various addressing modes and data transfer instruction of target microprocessor.											
CO – PO MAPPING	COURSE OUTCOMES	PROGRAM OUTCOME											
		1	2	3	4	5	6	7	8	9	10	11	12
	CO1		2	3		2						2	
	CO2			3								2	
	CO3	3		3								3	
	CO4		2	3								2	
	CO5		3	2								2	

LIST OF EXPERIMENTS:

8086 Programs using kits and MASM

1. Basic arithmetic and Logical operations
2. Move a data block without overlap
3. Code conversion, decimal arithmetic and Matrix operations.
4. Floating point operations, string manipulations, sorting and searching
5. Password checking, Print RAM size and system date
6. Counters and Time Delay

Peripherals and Interfacing Experiments

7. Traffic light control
8. Stepper motor control
9. Digital clock
10. Key board and Display
11. Printer status
12. Serial interface and Parallel interface
13. A/D and D/A interface and Waveform Generation

8051 Experiments using kits and MASM

14. Basic arithmetic and Logical operations
15. Square and Cube program, Find 2‟s complement of a number
16. Unpacked BCD to ASCII

TOTAL: 45 PERIODS

Content beyond Syllabus:	PIC microcontroller
Reference Books	1. Muhammad Ali Mazidi, Janice Gillispie Mazidi, Rolin D.MCKinlay The 8051Microcontroller and Embedded Systems, Second Edition, Pearson Education 2008. 2. Kenneth J. Ayala, “The 8086 Microprocessor: Programming & Interfacing The PC”,Delmar Publishers, 2007.

	3. A K Ray, K M Bhurchandi, Advanced Microprocessors and Peripherals, TMH, 2007
Website:	www.nptel.iitm.ac.in ocw.mit.edu
ONLINE RESOURCES	PPT Presentation Online Objective Questions Videos Materials if any (You tube)

MG6851 PRINCIPLES OF MANAGEMENT LT P C
3 0 0 3

PREREQUISITE:	Basic Management												
COURSE OBJECTIVES:	To learn 1.Basic measurement concepts 2.Concepts of electronic measurements 3.Importance of signal generators and signal analysers in measurements 4.Relevance of digital instruments in measurements 5.The need for data acquisition systems 6.Measurement techniques in optical domains												
COURSE OUTCOMES	CO1	Assess the managerial functions of planning, organizing, staffing, leading& controlling.											
	CO2	Discuss about international aspect of management.											
	CO3	Improve the organizing ability for career development											
	CO4	Explain about creativity and innovation.											
	CO5	Conclude the issues of environment and sustainable development in his personal and professional undertakings											
CO – PO MAPPING	COURSE OUTCOMES	PROGRAM OUTCOME											
		1	2	3	4	5	6	7	8	9	10	11	12
	CO1	3					3		2	2			
	CO2	2				2			2				
	CO3								2	2			3
	CO4						3	2					2
	CO5						2	3	2	2			

UNIT I INTRODUCTION TO MANAGEMENT AND ORGANIZATIONS 9

Definition of Management – Science or Art – Manager Vs Entrepreneur - types of managers - managerial roles and skills – Evolution of Management – Scientific, human relations , system and contingency approaches – Types of Business organization - Sole proprietorship, partnership, company-public and private sector enterprises - Organization culture and Environment – Current trends and issues in Management.

UNIT II PLANNING 9

Nature and purpose of planning – planning process – types of planning – objectives – setting objectives – policies – Planning premises – Strategic Management – Planning Tools and Techniques
– Decision making steps and process.

UNIT III ORGANISING 9

Nature and purpose – Formal and informal organization – organization chart – organization structure

– types – Line and staff authority – departmentalization – delegation of authority – centralization and decentralization – Job Design - Human Resource Management – HR Planning, Recruitment, selection, Training and Development, Performance Management , Career planning and management.

UNIT IV DIRECTING **9**

Foundations of individual and group behaviour – motivation – motivation theories – motivational techniques – job satisfaction – job enrichment – leadership – types and theories of leadership – communication – process of communication – barrier in communication – effective communication – communication and IT.

UNIT VCONTROLLING **9**

System and process of controlling – budgetary and non-budgetary control techniques – use of computers and IT in Management control – Productivity problems and management – control and performance – direct and preventive control – reporting.

TOTAL: 45 PERIODS

Content beyond Syllabus:	1. Benchmarking 2.Planning Operations
Text Books	Stephen P. Robbins and Mary Coulter, 'Management', Prentice Hall of India, 8th edition. 2. Charles W L Hill, Steven L McShane, 'Principles of Management', Mcgraw Hill Education, Special Indian Edition, 2007.
Reference Books	1 Hellriegel, Slocum & Jackson, ' Management - A Competency Based Approach', Thomson South Western, 10th edition, 2007. 2.Harold Koontz, Heinz Weihrich and Mark V Cannice, 'Management – A global & Entrepreneurial Perspective', Tata Mcgraw Hill, 12th edition, 2007. 3. Andrew J. Dubrin, 'Essentials of Management', Thomson Southwestern, 7th edition, 2007.
Website:	www.nptel.iitm.ac.in ocw.mit.edu
ONLINE RESOURCES	PPT Presentation Online Objective Questions Videos Materials if any (You tube)

CS6303 COMPUTER ARCHITECTURE **L T P C**
3 0 0 3

PREREQUISITE:	Fundamentals of Computing	
COURSE OBJECTIVES:	1. To have a thorough understanding of the basic structure and operation of a digital computer. 2. To discuss in detail the operation of the arithmetic unit including the algorithms & implementation of fixed-point and floating-point addition, subtraction, multiplication & division. 3. To study in detail the different types of control and the concept of pipelining. 4. To study the hierarchical memory system including cache memories and virtual memory. 5. To study the different ways of communicating with I/O devices and standard I/O interfaces	
COURSE OUTCOMES	CO1	Explain the architecture and organizations of computers.
	CO2	Analyze the control unit and ALU for simple application and thus able to identify engineering problem.
	CO3	Compare the pipelining and parallel processing techniques.
	CO4	Identify towards interfaces and memory and also examine the process architecture and organization.
	CO5	Discover new processor which helps them in lifelong application.

	COURSE OUTCOMES	PROGRAM OUTCOME											
		1	2	3	4	5	6	7	8	9	10	11	12
CO – PO MAPPING	CO1	3											
	CO2		3		2								
	CO3		3	2									
	CO4		3										
	CO5			3		3							3

UNIT I OVERVIEW & INSTRUCTIONS 9

Eight ideas – Components of a computer system – Technology – Performance – Power wall – Uniprocessors to multiprocessors; Instructions – operations and operands – representing instructions – Logical operations – control operations – Addressing and addressing modes.

UNIT II ARITHMETIC OPERATIONS 7

ALU - Addition and subtraction – Multiplication – Division – Floating Point operations – Subword parallelism.

UNIT III PROCESSOR AND CONTROL UNIT 11

Basic MIPS implementation – Building datapath – Control Implementation scheme – Pipelining – Pipelined datapath and control – Handling Data hazards & Control hazards – Exceptions.

UNIT IV PARALLELISM 9

Instruction-level-parallelism – Parallel processing challenges – Flynn's classification – Hardware multithreading – Multicore processors

UNIT V MEMORY AND I/O SYSTEMS 9

Memory hierarchy - Memory technologies – Cache basics – Measuring and improving cache performance - Virtual memory, TLBs - Input/output system, programmed I/O, DMA and interrupts, I/O processors.

TOTAL: 45 PERIODS

Content beyond Syllabus:	Expose the students to the various key aspects of Computer Organization and Architecture by enabling them to perform FPGA based prototyping of experiments with support of a virtual environment in http://virtual-labs.ac.in/labs/cse10/
Text Books	1. John P.Hayes, 'Computer architecture and Organisation', Tata McGraw-Hill, Third edition, 1998. 2. V.Carl Hamacher, Zvonko G. Varanesic and Safat G. Zaky, "Computer Organisation", V edition, McGraw-Hill Inc, 1996.
Reference Books	1. Morris Mano, "Computer System Architecture", Prentice-Hall of India, 2000. 2. Paraami, "Computer Architecture", BEH R002, Oxford Press. 3. P.Pal Chaudhuri, , "Computer organization and design", 2nd Ed., Prentice Hall of India, 2007. 4. G.Kane & J.Heinrich, ' MIPS RISC Architecture ', Englewood cliffs, New Jersey,Prentice Hall, 1992.
Website:	www.nptel.iitm.ac.in ocw.mit.edu
ONLINE RESOURCES	PPT Presentation Online Objective Questions Videos Materials if any (You tube)

CS6551 **COMPUTER NETWORKS** **L T P C**
3 0 0 3

PREREQUISITE:	Computer Architecture and Organization												
COURSE OBJECTIVES:	1. To introduce the students the functions of different layers. 2. To introduce IEEE standard employed in computer networking. 3. To make students to get familiarized with different protocols and network components												
COURSE OUTCOMES	CO1	Identify the components required to build different types of networks.											
	CO2	Choose the required functionality at each layer for given application.											
	CO3	Categorize about routing and multicast routing.											
	CO4	Relate the flow of information from one node to another node in the network											
	CO5	Apply the program in microprocessor using assembly language program.											
CO – PO MAPPING	COURSE OUTCOMES	PROGRAM OUTCOME											
		1	2	3	4	5	6	7	8	9	10	11	12
	CO1	3		2									
	CO2	3			2								
	CO3	3			2								
	CO4	3			2								
	CO5		2	3	2								

UNIT I FUNDAMENTALS & LINK LAYER **9**

Building a network – Requirements - Layering and protocols - Internet Architecture – Network software – Performance ; Link layer Services - Framing - Error Detection - Flow control

UNIT II MEDIA ACCESS & INTERNETWORKING **9**

Media access control - Ethernet (802.3) - Wireless LANs – 802.11 – Bluetooth - Switching and bridging – Basic Internetworking (IP, CIDR, ARP, DHCP,ICMP)

UNIT III ROUTING **9**

Routing (RIP, OSPF, metrics) – Switch basics – Global Internet (Areas, BGP, IPv6), Multicast – addresses – multicast routing (DVMRP, PIM)

UNIT IV TRANSPORT LAYER **9**

Overview of Transport layer - UDP - Reliable byte stream (TCP) - Connection management - Flow control - Retransmission – TCP Congestion control - Congestion avoidance (DECbit, RED) – QoS – Application requirements

UNIT V APPLICATION LAYER **9**

Traditional applications -Electronic Mail (SMTP, POP3, IMAP, MIME) – HTTP – Web Services – DNS – SNMP

TOTAL: 45 PERIODS

Content beyond Syllabus:	ATM protocol
Text Books	1.Behrouz A. Foruzan, "Data communication and Networking", Tata McGraw-Hill, 2006: Unit I-IV 2. Andrew S. Tannenbaum, "Computer Networks", Pearson Education, Fourth Edition, 2003: Unit V
Reference Books	1.Wayne Tomasi, "Introduction to Data Communication and Networking", 1/e, Pearson Education. 2.James .F. Kurouse & W. Rouse, "Computer Networking: A Topdown Approach Featuring",3/e, Pearson Education. 3.C.Sivaram Murthy, B.S.Manoj, "Ad hoc Wireless Networks – Architecture and Protocols", Second Edition, Pearson Education. 4.Greg Tomshon, Ed Tittel, David Johnson. "Guide to Networking Essentials", fifth edition, Thomson India Learning, 2007. 5. William Stallings, "Data and Computer Communication", Eighth Edition, Pearson Education, 2000.
Website:	www.nptel.iitm.ac.in ocw.mit.edu
ONLINE RESOURCES	PPT Presentation Online Objective Questions Videos Materials if any (You tube)

EC6001 MEDICAL ELECTRONICS L T P C

3 0 0 3

PREREQUISITE:	Linear Integrated Circuits												
COURSE OBJECTIVES:	To study the methods of recording various biopotentials To study how to measure biochemical and various physiological information To understand the working of units which will help to restore normal functioning To understand the use of radiation for diagnostic and therapy To understand the need and technique of electrical safety in Hospitals course												
COURSE OUTCOMES	CO1	Identify the electrodes used in medical field.											
	CO2	Measure the various electrical signals from human system											
	CO3	Examine the biochemical and physiological information.											
	CO4	Discuss the application of electronics in diagnostic and therapeutic area.											
	CO5	Construct a system for telemedicine and electrical safety											
CO – PO MAPPING	COURSE OUTCOMES	PROGRAM OUTCOME											
		1	2	3	4	5	6	7	8	9	10	11	12
	CO1	3											
	CO2				3	2							
	CO3		3										
	CO4			3									
	CO5		2	3									

UNIT I ELECTRO-PHYSIOLOGY AND BIO-POTENTIAL RECORDING 9

The origin of Bio-potentials; biopotential electrodes, biological amplifiers, ECG, EEG, EMG, PCG, lead systems and recording methods, typical waveforms and signal characteristics.

UNIT II BIO-CHEMICAL AND NON ELECTRICAL PARAMETER MEASUREMENT 9 pH, PO_2, PCO_2, colorimeter, Auto analyzer, Blood flow meter, cardiac output, respiratory measurement, Blood pressure, temperature, pulse, Blood Cell Counters.

UNIT III ASSIST DEVICES 9

Cardiac pacemakers, DC Defibrillator, Dialyser, Heart lung machine

UNIT IV PHYSICAL MEDICINE AND BIOTELEMETRY 9

Diathermies- Shortwave, ultrasonic and microwave type and their applications, Surgical Diathermy Telemetry principles, frequency selection, biotelemetry, radiopill, electrical safety

UNIT V RECENT TRENDS IN MEDICAL INSTRUMENTATION 9

Thermograph, endoscopy unit, Laser in medicine, cryogenic application, Introduction to telemedicine

TOTAL: 45 PERIODS

Content beyond Syllabus:	Defibrillators
Text Books	1. Leislie Cromwell, "Biomedical instrumentation and measurement", Prentice Hall of India, New Delhi, 2007.
Reference Books	1.Khandpur, R.S., "Handbook of Biomedical Instrumentation", TATA McGraw-Hill, New Delhi, 2003. 2.Joseph J.Carr and John M.Brown, "Introduction to Biomedical equipment Technology", John Wiley and Sons, New York, 2004.
Website:	www.nptel.iitm.ac.in ocw.mit.edu
ONLINE RESOURCES	PPT Presentation Online Objective Questions Videos Materials if any (You tube)

EC6601 VLSI DESIGN L T P C

3 0 0 3

PREREQUISITE:	Linear Integrated Circuits												
COURSE OBJECTIVES:	1.The MOS circuit realization of the various building blocks that is common to any microprocessor or digital VLSI circuit is studied. 2. Concepts of Combinational logic circuits is studied. 3 .Design of Sequential logic circuits. 4. Architectural choices and performance tradeoffs involved in designing and realizing the circuits in CMOS technology are discussed. 5. FPGA implementation strategies.												
COURSEOUTCOMES	CO1	Explain the basics of CMOS circuits and the CMOS process technology.											
	CO2	Design and analysis of combinational logic circuits.											
	CO3	Design and analysis of sequential logic circuits.											
	CO4	Design and realization of adder circuits and multipliers.											
	CO5	Implementation of Full custom and Semicustom ICs.											
CO – PO MAPPING	COURSE OUTCOMES	PROGRAM OUTCOME											
		1	2	3	4	5	6	7	8	9	10	11	12
	CO1	3		2		2							
	CO2			3		3							
	CO3			2	3	3						3	

	CO4			3		2						3	
	CO5	3		2								3	

UNIT I MOS TRANSISTOR PRINCIPLE 9

NMOS and PMOS transistors, Process parameters for MOS and CMOS, Electrical properties of CMOS circuits and device modeling, Scaling principles and fundamental limits, CMOS inverter scaling, propagation delays, Stick diagram, Layout diagrams

UNIT II COMBINATIONAL LOGIC CIRCUITS 9

Examples of Combinational Logic Design, Elmore‟s constant, Pass transistor Logic, Transmission gates, static and dynamic CMOS design, Power dissipation – Low power design principles

UNIT III SEQUENTIAL LOGIC CIRCUITS 9

Static and Dynamic Latches and Registers, Timing issues, pipelines, clock strategies, Memory architecture and memory control circuits, Low power memory circuits, Synchronous and Asynchronous design

UNIT IVDESIGNING ARITHMETIC BUILDING BLOCKS 9

Data path circuits, Architectures for ripple carry adders, carry look ahead adders, High speed adders, accumulators, Multipliers, dividers, Barrel shifters, speed and area tradeoff

UNIT V IMPLEMENTATION STRATEGIES 9

Full custom and Semi custom design, Standard cell design and cell libraries, FPGA building block architectures, FPGA interconnect routing procedures.

TOTAL: 45 PERIODS

Content beyond Syllabus:	Design hierarchies in VHDL
Text Books	1.Weste and Harris: CMOS VLSI DESIGN (Third edition) Pearson Education, 2005 2. Uyemura J.P: Introduction to VLSI circuits and systems, Wiley 2002.
Reference Books	1.D.A Pucknell & K.Eshraghian Basic VLSI Design, Third edition, PHI, 2003 2.Wayne Wolf, Modern VLSI design, Pearson Education, 2003 3.M.J.S.Smith: Application specific integrated circuits, Pearson Education, 1997 4.J.Bhasker: Verilog HDL primer, BS publication,2001 5. Ciletti Advanced Digital Design with the Verilog HDL, Prentice Hall of India, 2003
Website:	www.nptel.iitm.ac.in ocw.mit.edu
ONLINE RESOURCES	PPT Presentation Online Objective Questions Videos Materials if any (You tube)

EC6602 **ANTENNA AND WAVE PROPAGATION** **L T P C**

3 0 0 3

PREREQUISITE:	Transmission Line and Waveguides												
COURSE OBJECTIVES:	1. To study radiation from a current element. 2. To study antenna arrays 3. To study aperture antennas 4. To learn special antennas such as frequency independent and broad band antennas. 5. To study radio wave propagation												
COURSEOUTCOMES	CO1	Understand the various types of antennas and wave propagation.											
	CO2	Analyze the antenna arrays, aperture antennas and special antennas such as frequency independent and broad band.											
	CO3	Predict the radio wave propagation in sky											
	CO4	Evaluate the ionospheric and tropospheric wave propagation.											
	CO5	Sketch the radiation pattern from a current element.											
CO – PO MAPPING	COURSE OUTCOMES	PROGRAM OUTCOME											
		1	2	3	4	5	6	7	8	9	10	11	12
	CO1	3											
	CO2		3	2									
	CO3			3									
	CO4		3		2								
	CO5		3	2									

UNIT I FUNDAMENTALS OF RADIATION **9**

Definition of antenna parameters – Gain, Directivity, Effective aperture, Radiation Resistance, Band width, Beam width, Input Impedance. Matching – Baluns, Polarization mismatch, Antenna noise temperature, Radiation from oscillating dipole, Half wave dipole. Folded dipole, Yagi array.

UNIT IIAPERTURE AND SLOT ANTENNAS **9**

Radiation from rectangular apertures, Uniform and Tapered aperture, Horn antenna , Reflector antenna , Aperture blockage , Feeding structures , Slot antennas ,Microstrip antennas – Radiation mechanism – Application ,Numerical tool for antenna analysis

UNIT IIIANTENNA ARRAYS **9**

N element linear array, Pattern multiplication, Broadside and End fire array – Concept of Phased arrays, Adaptive array, Basic principle of antenna Synthesis-Binomial array

UNIT IV SPECIAL ANTENNAS **9**

Principle of frequency independent antennas –Spiral antenna, Helical antenna, Log periodic. Modern antennas-Reconfigurable antenna, Active antenna, Dielectric antennas, Electronic band gap structure and applications, Antenna Measurements-Test Ranges, Measurement of Gain, Radiation pattern, Polarization, VSWR

UNIT V PROPAGATION OF RADIO WAVES **9**

Modes of propagation , Structure of atmosphere , Ground wave propagation , Tropospheric propagation , Duct propagation, Troposcatter propagation , Flat earth and Curved earth concept Sky wave propagation – Virtual height, critical frequency , Maximum usable frequency – Skip distance, Fading , Multi hop propagation

TOTAL: 45 PERIODS

Content beyond Syllabus:	Chbysev Array

Text Books	1.E.C.Jordan and Balmain, "Electromagnetic waves and Radiating Systems", Pearson Education / PHI, 2006 2. A.R.Harish, M.Sachidanada, "Antennas and Wave propagation", Oxford University Press, 2007
Reference Books	John D.Kraus, Ronald J Marhefka and Ahmad S Khan, "Antennas for all Applications", Tata McGraw-Hill Book Company, 3 ed, 2007. G.S.N.Raju, Antenna Wave Propagation, Pearson Education, 2004. Constantine A. Balanis, Antenna Theory Analysis and Desin, John Wiley, 2nd Edition, 2007. R.E.Collins, "Antenna and Radiowave propagation", W.L Stutzman and G.A. Thiele, "Antenna analysis and design", John Wiley, 2000.
Website:	www.nptel.iitm.ac.in ocw.mit.edu
ONLINE RESOURCES	PPT Presentation Online Objective Questions Videos Materials if any (You tube)

EC6611 COMPUTER NETWORKS LABORATORY L T P C
0 0 3 2

PREREQUISITE:	Digital Signal Processing												
COURSE OBJECTIVES:	1.To implement serial and parallel communication using various buses 2. To learn about various serial and parallel communication protocols												
COURSEOUTCOMES	CO1	Demonstrate the Communication between two desktop computers.											
	CO2	Elaboratethe different protocols used in computer communication.											
	CO3	Illustrate the Program using sockets.											
	CO4	Implement and compare the various routing algorithms											
	CO5	Experiment the various simulation tools needed for communication of computers.											
CO – PO MAPPING	COURSE OUTCOMES	PROGRAM OUTCOME											
		1	2	3	4	5	6	7	8	9	10	11	12
	CO1		3		2	2							
	CO2				3	2							
	CO3			3		2							
	CO4			3		2							
	CO5			3		2							

LIST OF EXPERIMENTS:

1. Implementation of Error Detection / Error Correction Techniques
2. Implementation of Stop and Wait Protocol and sliding window
   1. Implementation and study of Goback-N and selective repeat protocols
2. Implementation of High Level Data Link Control
3. Study of Socket Programming and Client – Server model
4. Write a socket Program for Echo/Ping/Talk commands.
5. To create scenario and study the performance of network with CSMA / CA protocol and compare with CSMA/CD protocols.
6. Network Topology - Star, Bus, Ring
7. Implementation of distance vector routing algorithm
10. Implementation of Link state routing algorithm

11. Study of Network simulator (NS) and simulation of Congestion Control Algorithms using NS
12. Encryption and decryption.

TOTAL: 45 PERIODS

EC6612 **VLSI DESIGN LABORATORY** **L T P C**

Content beyond Syllabus:	1.Study of 2 layer switches and 3 layer routers
Reference Books	1.Wayne Tomasi, "Introduction to Data Communication and Networking", 1/e, Pearson Education. 2.James .F. Kurouse & W. Rouse, "Computer Networking: A Topdown Approach Featuring",3/e, Pearson Education. 3.C.Sivaram Murthy, B.S.Manoj, "Ad hoc Wireless Networks – Architecture and Protocols", Second Edition, Pearson Education. 4.Greg Tomshon, Ed Tittel, David Johnson. "Guide to Networking Essentials", fifth edition, Thomson India Learning, 2007. 5. William Stallings, "Data and Computer Communication", Eighth Edition, Pearson Education, 2000
Website:	www.nptel.iitm.ac.in ocw.mit.edu
ONLINE RESOURCES	PPT Presentation Online Objective Questions Videos Materials if any (You tube)

0 0 3 2

PREREQUISITE:	Electronic Circuits Simulation Laboratory-II												
COURSE OBJECTIVES:	1. To learn the basic CMOS circuits. 2. To learn the CMOS process technology. 3. To learn techniques of chip design using programmable devices. 4. To learn the concepts of designing VLSI subsystems. 5. To learn the concepts of modeling a digital system using Hardware Description Language												
COURSE OUTCOMES	CO1	Develop the HDL code for basic as well as advanced digital integrated circuits.											
	CO2	Import the logic modules into FPGA Boards.											
	CO3	Perform the Synthesization, Place and Route the digital IPs.											
	CO4	Design, Simulate and Extract the layouts of Analog IC Blocks using EDA tools.											
	CO5	Simulate the modern chip manufacturing software tools.											
CO – PO MAPPING	COURSE OUTCOMES	PROGRAM OUTCOME											
		1	2	3	4	5	6	7	8	9	10	11	12
	CO1			3		2						3	
	CO2			3								3	
	CO3		3									3	
	CO4			3								3	
	CO5			3		2						3	

.

LIST OF EXPERIMENTS

FPGA BASED EXPERIMENTS.

1. HDL based design entry and simulation of simple counters, state machines, adders (min 8 bit) and multipliers (4 bit min).
2. Synthesis, P&R and post P&R simulation of the components simulated in (I) above. Critical paths and static timing analysis results to be identified. Identify and verify possible conditions under which the blocks will fail to work correctly.
3. Hardware fusing and testing of each of the blocks simulated in (I). Use of either chipscope feature (Xilinx) or the signal tap feature (Altera) is a must. Invoke the PLL and demonstrate the use of the PLL module for clock generation in FPGAs.

IC DESIGN EXPERIMENTS: (BASED ON CADENCE / MENTOR GRAPHICS / EQUIVALENT)

4. Design and simulation of a simple 5 transistor differential amplifier. Measure gain, ICMR, and CMRR
5. Layout generation, parasitic extraction and resimulation of the circuit designed in (I)
6. Synthesis and Standard cell based design of an circuits simulated in 1(I) above. Identification of critical paths, power consumption.For expt (c) above, P&R, power and clock routing, and post P&R simulation.
7. Analysis of results of static timing analysis.

TOTAL: 45 PERIODS

Content beyond Syllabus:	1.Design of vending machine using verilog HDL
Reference Books	1.D.A Pucknell & K.Eshraghian Basic VLSI Design, Third edition, PHI, 2003 2.Wayne Wolf, Modern VLSI design, Pearson Education, 2003 3.M.J.S.Smith: Application specific integrated circuits, Pearson Education, 1997 4.J.Bhasker: Verilog HDL primer, BS publication,2001 5. Ciletti Advanced Digital Design with the Verilog HDL, Prentice Hall of India, 2003
Website:	1. www.nptel.iitm.ac.in
ONLINE RESOURCES	PPT Presentation Online Objective Questions Videos Materials if any (You tube)

GE6674 COMMUNICATION AND SOFT SKILLS- LABORATORY BASED L T P C
0 0 4 2

PREREQUISITE:	Technical English -II	
COURSE OBJECTIVES:	1. To equip students of engineering and technology with effective speaking and listening skills in English. 2. To help them develop their soft skills and interpersonal skills, which will make the transition from college to workplace smoother and help them excel in their job. 3.To enhance the performance of students at Placement Interviews, Group Discussions and other recruitment exercises	
COURSE OUTCOMES	CO1	Take international examination such as IELTS and TOEFL
	CO2	Make presentations and Participate in Group Discussions.
	CO3	Successfully answer questions in interviews.
	CO4	Develop felicity of expression and familiarity with technology enabled Communication
	CO5	Analyse, distinguish and Prepare their own resume and report.
CO – PO	COURSE	PROGRAM OUTCOME

MAPPING	OUTCOMES	1	2	3	4	5	6	7	8	9	10	11	12
	CO1										3		
	CO2										3		
	CO3								2		3		
	CO4								2		3		
	CO5								2		3		

UNIT I LISTENING AND SPEAKING SKILLS 12

Conversational skills (formal and informal)- group discussion- making effective presentations using computers, listening/watching interviews conversations, documentaries. Listening to lectures, discussions from TV/ Radio/ Podcast.

UNIT II READING AND WRITING SKILLS 12

Reading different genres of tests ranging from newspapers to creative writing. Writing job applications- cover letter- resume- emails- letters- memos- reports. Writing abstracts- summaries-interpreting visual texts.

UNIT III ENGLISH FOR NATIONAL AND INTERNATIONAL EXAMINATIONS AND PLACEMENTS 12

International English Language Testing System (IELTS) - Test of English as a Foreign Language (TOEFL) - Civil Service(Language related)- Verbal Ability.

UNIT IV INTERVIEW SKILLS 12

Different types of Interview format- answering questions- offering information- mock interviews-body language(paralinguistic features)- articulation of sounds- intonation.

UNIT V SOFT SKILLS 12 Motivation- emotional intelligence-Multiple intelligences- emotional intelligence-managing changes-time management-stress management-leadership straits-team work- career planning - intercultural communication- creative and critical thinking

TOTAL: 60 PERIODS

Content beyond Syllabus:	1.Report preparation
Reference Books	1.Anderson, P.V, Technical Communication, Thomson Wadsworth , Sixth Edition, New Delhi, 2007. 2.Prakash, P, Verbal and Non-Verbal Reasoning, Macmillan India Ltd., Second Edition, New Delhi, 2004. 3.John Seely, The Oxford Guide to Writing and Speaking, Oxford University Press, New Delhi, 2004. 4.Evans, D, Decisionmaker, Cambridge University Press, 1997. 5.Thorpe, E, and Thorpe, S, Objective English, Pearson Education, Second Edition, New Delhi, 2007. 6.Turton, N.D and Heaton, J.B, Dictionary of Common Errors, Addision Wesley Longman Ltd., Indian reprint 1998.

Website:	Website www.nptel.iitm.ac.in ocw.mit.edu
ONLINE RESOURCES	PPT Presentation Online Objective Questions Videos Materials if any (You tube)
Content beyond Syllabus:	1.Report preparation

EC6701 RF AND MICROWAVE ENGINEERING L T P C
3 0 0 3

PREREQUISITE:	Antenna and Wave Propagation												
COURSE OBJECTIVES:	1. To study about multi- port RF networks and RF transistor amplifiers 2. To study passive microwave components and their S- Parameters. 3. To study Microwave semiconductor devices & applications. 4.To study Microwave sources and amplifiers												
COURSE OUTCOMES	CO1	Label low and high frequency components.											
	CO2	Compare BJT transistor and RF transistor.											
	CO3	Formulate two-port junction.											
	CO4	Analyze different fabrication techniques.											
	CO5	Justify measurements with detailed design techniques.											
CO – PO MAPPING	COURSE OUTCOMES	PROGRAM OUTCOME											
		1	2	3	4	5	6	7	8	9	10	11	12
	CO1		3										
	CO2		3										
	CO3			3									
	CO4		3										
	CO5			3									

UNIT I TWO PORT NETWORK THEORY 9

Review of Low frequency parameters: Impedance, Admittance, Hybrid and ABCD parameters, Different types of interconnection of Two port networks, High Frequency parameters, Formulation of S parameters, Properties of S parameters, Reciprocal and lossless Network, Transmission matrix, RF behavior of Resistors, Capacitors and Inductors.

UNIT II RF AMPLIFIERS AND MATCHING NETWORKS 9

Characteristics of Amplifiers, Amplifier power relations, Stability considerations, Stabilization Methods, Noise Figure, Constant VSWR, Broadband, High power and Multistage Amplifiers, Impedance matching using discrete components, Two component matching Networks, Frequency response and quality factor, T and Pi Matching Networks, Microstrip Line Matching Networks.

UNIT IIIPASSIVE AND ACTIVE MICROWAVE DEVICES 9

Terminations, Attenuators, Phase shifters, Directional couplers, Hybrid Junctions, Power dividers, Circulator, Isolator, Impedance matching devices: Tuning screw, Stub and quarter wave transformers. Crystal and Schottkey diode detector and mixers, PIN diode switch, Gunn diode oscillator, IMPATT diode oscillator and amplifier, Varactor diode, Introduction to MIC.

UNIT IV MICROWAVE GENERATION 9

Review of conventional vacuum Triodes, Tetrodes and Pentodes, High frequency effects in vacuum Tubes, Theory and application of Two cavity Klystron Amplifier, Reflex Klystron oscillator, Traveling wave tube amplifier, Magnetron oscillator using Cylindrical, Linear, Coaxial Voltage tunable Magnetrons, Backward wave Crossed field amplifier and oscillator.

UNIT V MICROWAVE MEASUREMENTS **9**

Measuring Instruments : Principle of operation and application of VSWR meter, Power meter, Spectrum analyzer, Network analyzer, Measurement of Impedance, Frequency, Power, VSWR, Q-factor, Dielectric constant, Scattering coefficients, Attenuation, S-parameters.

TOTAL: 45 PERIODS

Content beyond Syllabus:	TE and TM waves in circular wave guide.
Text Books	1. Samuel Y Liao, "Microwave Devices & Circuits" , Prentice Hall of India, 2006. 2. Reinhold.Ludwig and Pavel Bretshko 'RF Circuit Design", Pearson Education, Inc.,2006
Reference Books	1. Robert. E.Collin-Foundation of Microwave Engg –Mc Graw Hill. 2. Annapurna Das and Sisir K Das, "Microwave Engineering", Tata Mc GrawHill Inc., 2004. 3. M.M.Radmanesh , RF & Microwave Electronics Illustrated, Pearson Education, 2007. 4. Robert E.Colin, 2ed "Foundations for Microwave Engineering", McGraw Hill, 2001 5. D.M.Pozar, "Microwave Engineering.", John Wiley & sons, Inc., 2006.
Website:	www.nptel.iitm.ac.in ocw.mit.edu
ONLINE RESOURCES	1.PPT Presentation 2.Online Objective Questions 3.Videos Materials if any (You tube)

EC6702 OPTICAL COMMUNICATION AND NETWORKS **L T P C**

3 0 0 3

PREREQUISITE:	Electro Magnetic Fields	
COURSE OBJECTIVES:	1. To learn the basic elements of optical fiber transmission link, fiber modes configurations and structures. 2. To understand the different kind of losses, signal distortion in optical wave guides and other signal degradation factors. Design optimization of SM fibers, RI profile and cut-off wave length. 3. To learn the various optical source materials, LED structures, quantum efficiency, Laser diodes and different fiber amplifiers. 4. To learn the fiber optical receivers such as PIN APD diodes, noise performance in photo detector, receiver operation and configuration. 5. To learn fiber slicing and connectors, noise effects on system performance, operational principles WDM and solutions	
COURSE OUTCOMES	CO1	Understand the basic elements of optical fiber transmission link and modes of configuration.
	CO2	Explain different kind of losses, distortion and degradation.
	CO3	Have clear knowledge on optical sources and optical detectors.
	CO4	Design transmitter and receiver of optical fiber sources.
	CO5	Interpret real time application.

	COURSE OUTCOMES	PROGRAM OUTCOME											
		1	2	3	4	5	6	7	8	9	10	11	12
CO – PO MAPPING	CO1	3											
	CO2		3										
	CO3	3											
	CO4			3									
	CO5		2	2		3							

UNIT I INTRODUCTION TO OPTICAL FIBERS 9

Evolution of fiber optic system- Element of an Optical Fiber Transmission link-- Total internal reflection-Acceptance angle –Numerical aperture – Skew rays Ray Optics-Optical Fiber Modes and Configurations -Mode theory of Circular Wave guides- Overview of Modes-Key Modal concepts-Linearly Polarized Modes -Single Mode Fibers-Graded Index fiber structure.

UNIT II SIGNAL DEGRADATION OPTICAL FIBERS 9

Attenuation - Absorption losses, Scattering losses, Bending Losses, Core and Cladding losses, Signal Distortion in Optical Wave guides-Information Capacity determination -Group Delay-Material Dispersion, Wave guide Dispersion, Signal distortion in SM fibers-Polarization Mode dispersion, Intermodal dispersion, Pulse Broadening in GI fibers-Mode Coupling -Design Optimization of SM fibers-RI profile and cut-off wavelength.

UNIT III FIBER OPTICAL SOURCES AND COUPLING 9

Direct and indirect Band gap materials-LED structures -Light source materials -Quantum efficiency and LED power, Modulation of a LED, lasers Diodes-Modes and Threshold condition -Rate equations -External Quantum efficiency -Resonant frequencies -Laser Diodes, Temperature effects, Introduction to Quantum laser, Fiber amplifiers- Power Launching and coupling, Lencing schemes, Fiber -to- Fiber joints, Fiber splicing-Signal to Noise ratio , Detector response time.

UNIT IVFIBER OPTIC RECEIVER AND MEASUREMENTS 9

Fundamental receiver operation, Pre amplifiers, Error sources – Receiver Configuration– Probability of Error – Quantum limit.Fiber Attenuation measurements- Dispersion measurements – Fiber Refractive index profile measurements – Fiber cut- off Wave length Measurements – Fiber Numerical Aperture Measurements – Fiber diameter measurements.

UNIT V OPTICAL NETWORKS AND SYSTEM TRANSMISSION 9

Basic Networks – SONET / SDH – Broadcast – and –select WDM Networks –Wavelength Routed Networks – Non linear effects on Network performance –-Link Power budget -Rise time budget-Noise Effects on System Performance-Operational Principles of WDM Performance of WDM + EDFA system – Solutions – Optical CDMA – Ultra High Capacity Networks**.**

TOTAL: 45 PERIODS

Content beyond Syllabus:	1. Applications of fiber optics in Telecommunication
Text Books	1. Optical Fiber Communication – John M. Senior – Pearson Education – Second Edition. 2007 2. Optical Fiber Communication – Gerd Keiser – Mc Graw Hill – Third Edition. 2000 .
Reference Books	1. J.Gower, “Optical Communication System”, Prentice Hall of India, 2001 2. Rajiv Ramaswami, “Optical Networks “ , Second Edition, Elsevier , 2004. 3. Govind P. Agrawal, “ Fiber-optic communication systems”, third edition, John Wiley & sons, 2004.

	4. R.P. Khare, "Fiber Optics and Optoelectronics", Oxford University Press, 2007.
Website:	www.nptel.iitm.ac.in ocw.mit.edu
ONLINE RESOURCES	1.PPT Presentation 2.Online Objective Questions 3.Videos Materials if any (You tube)

EC6703 EMBEDDED AND REAL TIME SYSTEMS L T P C
3 0 0 3

PREREQUISITE:	Microprocessor and Microcontroller												
COURSE OBJECTIVES:	1.To design various analog electronic circuits using different simulator 2.To design and construct digital circuits												
COURSE OUTCOMES	CO1	Explain the modulation and demodulation techniques.											
	CO2	Experiment with the various types of Flip- flops and verify their truth tables.											
	CO3	Test for electronic circuits and design PCB layout using CAD.											
	CO4	Design different types of filters.											
	CO5	Develop mini-projects based on programming and designing of a simple application.											
CO – PO MAPPING	COURSE OUTCOMES	PROGRAM OUTCOME											
		1	2	3	4	5	6	7	8	9	10	11	12
	CO1			3								2	
	CO2			3								2	
	CO3			3		2						2	
	CO4			3								2	
	CO5			3								2	

UNIT I INTRODUCTION TO EMBEDDED COMPUTING AND ARM PROCESSORS 9

Complex systems and micro processors– Embedded system design process –Design example: Model train controller- Instruction sets preliminaries - ARM Processor – CPU: programming input and output-supervisor mode, exceptions and traps – Co-processors- Memory system mechanisms – CPU performance- CPU power consumption.

UNIT II EMBEDDED COMPUTING PLATFORM DESIGN 9

The CPU Bus-Memory devices and systems–Designing with computing platforms – consumer electronics architecture – platform-level performance analysis - Components for embedded programs-Models of programs-Assembly, linking and loading – compilation techniques- Program level performance analysis – Software performance optimization – Program level energy and power analysis and optimization – Analysis and optimization of program size- Program validation and testing.

UNIT III PROCESSES AND OPERATING SYSTEMS 9

Introduction – Multiple tasks and multiple processes – Multirate systems- Preemptive real-time operating systems- Priority based scheduling- Interprocess communication mechanisms – Evaluating operating system performance- power optimization strategies for processes – Example Real time operating systems-POSIX-Windows CE.

UNIT V SYSTEM DESIGN TECHNIQUES AND NETWORKS 9

Design methodologies- Design flows - Requirement Analysis – Specifications-System analysis and architecture design – Quality Assurance techniques- Distributed embedded systems – MPSoCs and shared memory multiprocessors.

UNIT V CASE STUDY 9

Data compressor - Alarm Clock - Audio player - Software modem-Digital still camera - Telephone answering machine-Engine control unit – Video accelerator.

TOTAL: 45 PERIODS

Content beyond Syllabus:	1. Applications of embedded
Text Books	1. Marilyn Wolf, "Computers as Components - Principles of Embedded Computing System Design", Third Edition "Morgan Kaufmann Publisher (An imprint from Elsevier), 2012. .
Reference Books	1. J Jonathan W.Valvano, "Embedded Microcomputer Systems Real Time Interfacing", Third Edition Cengage Learning, 2012. 2. David. E. Simon, "An Embedded Software Primer", 1st Edition, Fifth Impression, Addison-Wesley Professional, 2007. 3. Raymond J.A. Buhr, Donald L.Bailey, "An Introduction to Real-Time Systems- From Design to Networking with C/C++", Prentice Hall, 1999.
Website:	www.nptel.iitm.ac.in ocw.mit.edu
ONLINE RESOURCES	1.PPT Presentation 2.Online Objective Questions 3.Videos Materials if any (You tube)

EC6711 EMBEDDED LABORATORY L T P C 0 0 3 2

PREREQUISITE:	Microprocessor and Microcontroller
COURSE OBJECTIVES:	1.To design various analog electronic circuits using different simulator 2.To design and construct digital circuits

COURSE OUTCOMES	CO1	Explain the modulation and demodulation techniques.											
	CO2	Experiment with the various types of Flip- flops and verify their truth tables.											
	CO3	Test for electronic circuits and design PCB layout using CAD.											
	CO4	Design different types of filters.											
	CO5	Develop mini-projects based on programming and designing of a simple application.											
CO – PO MAPPING	COURSE OUTCOMES	PROGRAM OUTCOME											
		1	2	3	4	5	6	7	8	9	10	11	12
	CO1			3								2	
	CO2			3								2	
	CO3			3		2						2	
	CO4			3								2	
	CO5			3								2	

LIST OF EXPERIMENTS

1. Study of ARM evaluation system
2. Interfacing ADC and DAC.
3. Interfacing LED and PWM.
4. Interfacing real time clock and serial port.
5. Interfacing keyboard and LCD.
6. Interfacing EPROM and interrupt.
7. Mailbox.
8. Interrupt performance characteristics of ARM and FPGA.
9. Flashing of LEDS.
10. Interfacing stepper motor and temperature sensor.
11. Implementing zigbee protocol with ARM.

Content beyond Syllabus	1. Design of QPSK modulator / demodulator
Reference Books	1.John.G. Proakis, "Fundamentals of Communication Systems", Pearson Education,2006. 2.Millman J and Halkias .C., Integrated Electronics, TMH, 2007.
Website:	www.nptel.iitm.ac.in ocw.mit.edu
ONLINE RESOURCES	1.PPT Presentation 2.Online Objective Questions 3.Videos Materials if any (You tube)

EC6712 OPTICAL AND MICROWAVE LABORATORY L T P C
0 0 3 2

PREREQUISITE:	Antenna and Wave Propagation
COURSE OBJECTIVES:	1.To analyze the characteristics of microwave devices and components 2. To introduce the student about analog and digital optical link 3. To measure various antenna parameters

COURSE OUTCOMES	CO1	Different characteristics of klystron and Gunn diode.											
	CO2	Solve theoretical S – Parameter measurement with the practical value.											
	CO3	Implement S – Matrix characterization.											
	CO4	Evaluate the radiation pattern, gain and directivity of any antenna.											
	CO5	Design fiber optic analog and digital link.											
CO – PO MAPPING	COURSE OUTCOMES	PROGRAM OUTCOME											
		1	2	3	4	5	6	7	8	9	10	11	12
	CO1	3											
	CO2		3										
	CO3			3									
	CO4		3										
	CO5			3									

LIST OF EXPERIMENTS

OPTICAL EXPERIMENTS

1. DC Characteristics of LED and PIN Photo diode
2. Mode Characteristics of Fibers
3. Measurement of connector and bending losses
4. Fiber optic Analog and Digital Link- frequency response(analog) and eye diagram (digital)
5. Numerical Aperture determination for Fibers
6. Attenuation Measurement in Fibers

MICROWAVE EXPERIMENTS

1. Reflex klystron or Gunn diode characteristics and basic microwave parameter measurement such as VSWR, frequency, wavelength.
2. Directional Coupler Characteristics.
3. Radiation Pattern of Horn Antenna.
4. S-parameter Measurement of the following microwave components (Isolator, Circulator, E plane Tee, H Plane Tee, Magic Tee)
5. Attenuation and Power Measurement

TOTAL: 45 PERIODS

Reference Books	1. Robert. E.Collin-Foundation of Microwave Engg –Mc Graw Hill. 2. Annapurna Das and Sisir K Das, “Microwave Engineering”, Tata Mc GrawHill Inc., 2004. 3. M.M.Radmanesh , RF & Microwave Electronics Illustrated, Pearson Education, 2007. 4. Robert E.Colin, 2ed “Foundations for Microwave Engineering”, McGraw Hill, 2001 5. D.M.Pozar, “Microwave Engineering.”, John Wiley & sons, Inc., 2006.
Website:	www.nptel.iitm.ac.in ocw.mit.edu
ONLINE RESOURCES	1.PPT Presentation 2.Online Objective Questions 3.Videos Materials if any (You tube)

EC6801 **WIRELESS COMMUNICATION** **L T P C**

3 0 0 3

PREREQUISITE:	Communication Theory, Digital Communication												
COURSE OBJECTIVES:	1. It deals with the fundamental cellular radio concepts such as frequency reuse and handoff. This also demonstrates the principle of trunking efficiency and how trunking and interference issues between mobile and base stations combine to affect the overall capacity of cellular systems. 2. It presents different ways to radio propagation models and predict the large – scale effects of radio propagation in many operating environment. This also covers small propagation effects such as fading, time delay spread and Doppler spread and describes how to measures and model the impact that signal bandwidth and motion have on the instantaneous received signal through the multi-path channel. 3. It provides idea about analog and digital modulation techniques used in wireless communication. 4. It also deals with the different types of equalization techniques and diversity concepts.. It provides an introduction to speech coding principles which have driven the development of adaptive pulse code modulation and linear predictive coding techniques. 5. It deals with advanced transceiver schemes and second generation and third generation wireless networks.												
COURSE OUTCOMES	CO1	Summarize the principles, algorithms and technologies used in transmission information.											
	CO2	Illustrate wire and wireless channel.											
	CO3	Acquire knowledge on different shift keying techniques in fading channels											
	CO4	Determine signal processing in wireless system.											
	CO5	Elaborate the application oriented design section.											
CO – PO MAPPING	COURSE OUTCOMES	PROGRAM OUTCOME											
		1	2	3	4	5	6	7	8	9	10	11	12
	CO1	3											
	CO2	3											
	CO3	3	2									2	
	CO4			3								2	
	CO5		3									2	

UNIT I WIRELESS CHANNELS **9**

Large scale path loss – Path loss models: Free Space and Two-Ray models -Link Budget design – Small scale fading- Parameters of mobile multipath channels – Time dispersion parameters-Coherence bandwidth – Doppler spread & Coherence time, Fading due to Multipath time delay spread – flat fading – frequency selective fading – Fading due to Doppler spread – fast fading – slow fading.

UNIT II CELLULAR ARCHITECTURE **9**

Multiple Access techniques - FDMA, TDMA, CDMA – Capacity calculations–Cellular concept- Frequency reuse - channel assignment- hand off- interference & system capacity- trunking & grade of service – Coverage and capacity improvement.

UNIT IIIDIGITAL SIGNALING FOR FADING CHANNELS **9**

Structure of a wireless communication link, Principles of Offset-QPSK, p/4-DQPSK, Minimum Shift Keying, Gaussian Minimum Shift Keying, Error performance in fading channels, OFDM principle – Cyclic prefix, Windowing, PAPR.

UNIT IVMULTIPATH MITIGATION TECHNIQUES **9**

Equalisation – Adaptive equalization, Linear and Non-Linear equalization, Zero forcing and LMS Algorithms. Diversity – Micro and Macrodiversity, Diversity combining techniques, Error probability in fading channels with diversity reception, Rake receiver,

UNIT VMULTIPLE ANTENNA TECHNIQUES **9**

MIMO systems – spatial multiplexing -System model -Pre-coding - Beam forming - transmitter diversity, receiver diversity- Channel state information-capacity in fading and non-fading channels.

TOTAL: 45 PERIODS

Content beyond Syllabus:	Clustering In Ad-Hoc Networks
Text Books	1. Rappaport. T.S., "Wireless communications", Pearson Education, 2003. 2. Gordon L. Stuber, "Principles of Mobile Communication", Springer International Ltd.,2001. 3. Andrea Goldsmith, Wireless Communications, Cambridge University Press, 2007.
Reference Books	1. Andreas.F. Molisch, "Wireless Communications", John Wiley – India, 2006. 2. Simon Haykin & Michael Moher, "Modern Wireless Communications", Pearson Education, 2007.
Website:	1. www.nptel.iitm.ac.in
ONLINE RESOURCES	1.PPT Presentation 2.Online Objective Questions 3.Videos Materials if any (You tube)

EC6802 **WIRELESS NETWORKS**

L T P C3 0 0 3

PREREQUISITE:	High Speed Networks
COURSE OBJECTIVES:	1.It deals with the fundamental cellular radio concepts such as frequency reuse and handoff. This also demonstrates the principle of trunking efficiency and how trunking and interference issues between mobile and base stations combine to affect the overall capacity of cellular systems. 2.It presents different ways to radio propagation models and predict the large – scale effects of radio propagation in many operating environment. This also covers small propagation effects such as fading, time delay spread and Doppler spread and describes how to measures and model the impact that signal bandwidth and motion have on the instantaneous received signal through the multi-path channel. It provides idea about analog and digital modulation techniques used in wireless communication

COURSE OUTCOMES	CO1	Explain the Challenging issues in Wireless Sensor Networks.											
	CO2	Summarize the componential architecture overview.											
	CO3	Distinguish the issues related to networking sensors.											
	CO4	Design and implementation of different protocols.											
	CO5	Develop the simulation of different sensor network platform.											
CO – PO MAPPING	COURSE OUTCOMES	PROGRAM OUTCOME											
		1	2	3	4	5	6	7	8	9	10	11	12
	CO1	3											
	CO2		3										
	CO3		2										
	CO4			3								2	
	CO5			3								2	

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UNIT I WIRELESS LAN **9**

Introduction-WLAN technologies: Infrared, UHF narrowband, spread spectrum -IEEE802.11: System architecture, protocol architecture, physical layer, MAC layer, 802.11b, 802.11a – Hiper LAN: WATM, BRAN, HiperLAN2 – Bluetooth: Architecture, Radio Layer, Baseband layer, Link manager Protocol, security - IEEE802.16-WIMAX: Physical layer, MAC, Spectrum allocation for WIMAX

UNIT II MOBILE NETWORK LAYER **9**

Introduction - Mobile IP: IP packet delivery, Agent discovery, tunneling and encapsulation, IPV6-Network layer in the internet- Mobile IP session initiation protocol - mobile ad-hoc network: Routing, Destination Sequence distance vector, Dynamic source routing

UNIT III MOBILE TRANSPORT LAYER **9**

TCP enhancements for wireless protocols - Traditional TCP: Congestion control, fast retransmit/fast recovery, Implications of mobility - Classical TCP improvements: Indirect TCP, Snooping TCP, Mobile TCP, Time out freezing, Selective retransmission, Transaction oriented TCP - TCP over 3G wireless networks**.**

UNIT IV WIRELESS WIDE AREA NETWORK **9**

Overview of UTMS Terrestrial Radio access network-UMTS Core network Architecture: 3G-MSC, 3G-SGSN, 3G-GGSN, SMS-GMSC/SMS-IWMSC, Firewall, DNS/DHCP-High speed Downlink packet access (HSDPA)- LTE network architecture and protocol.

UNIT V 4G NETWORKS **9**

Introduction – 4G vision – 4G features and challenges - Applications of 4G – 4G Technologies: Multicarrier Modulation, Smart antenna techniques, OFDM-MIMO systems, Adaptive Modulation and coding with time slot scheduler, Cognitive Radio.

TOTAL: 45 PERIODS

Content beyond Syllabus:	AODV ROUTING PROTOCOL DSR ROUTING PROTOCOL
Text Books	1. Jochen Schiller, "Mobile Communications", Second Edition, Pearson Education 2012.(Unit I,II,III) 2. Vijay Garg, "Wireless Communications and networking", First Edition, Elsevier 2007.(Unit IV,V)
Reference Books	1. Erik Dahlman, Stefan Parkvall, Johan Skold and Per Beming, "3G Evolution HSPA and LTE for Mobile Broadband", Second Edition, Academic Press, 2008. 2. Anurag Kumar, D.Manjunath, Joy kuri, "Wireless Networking", First Edition, Elsevier 2011. 3. Simon Haykin , Michael Moher, David Koilpillai, "Modern Wireless Communications", First Edition, Pearson Education 2013
Website:	www.nptel.iitm.ac.in
ONLINE RESOURCES	PPT Presentation Online Objective Questions Videos Materials if any (You tube)

EC6811 **PROJECT WORK** **L T P C**
0 0 12 6

PREREQUISITE:	Design A New Problem												
COURSE OBJECTIVES:	The aim of the project work is to deepen comprehension of principles by applying them to a new problem which may be the design												
COURSE OUTCOMES	CO1	Understand fundamental knowledge in various engineering subjects and applications.											
	CO2	Familiarize in the laser technology.											
	CO3	Develop the laser knowledge in fiber optics.											
	CO4	Apply the concepts of quantum mechanics to quantitatively predict behavior of physical systems.											
	CO5	Apply the crystal knowledge of in various materials and the internal structure of the materials.											
CO – PO MAPPING	COURSE OUTCOMES	PROGRAM OUTCOME											
		1	2	3	4	5	6	7	8	9	10	11	12
	CO1	3	2	2	2	2	2	2	2	2	3	3	2
	CO2	3	3	3	2	2	2	2	2	2	2	3	2
	CO3		3	3	2	3	2	2	2	2	2	3	2
	CO4		3	3	2	3	2	2	2	2	2	3	2
	CO5		3	3	2	3	2	2	2	2	2	3	2

TOTAL: 180 PERIODS

Content beyond Syllabus:	NIL
Text Books	4. S.K.Bhattacharya, 'Electrical Machines', Tata McGraw Hill Publishing company ltd, second edition, 2007. 5. V.K.Mehta and Rohit Mehta, 'Principles of Power System', S.Chand and CompanyLtd, second edition, 2006
Reference Books	27. D.P.Kothari and I.J.Nagrath, 'Basic Electrical Engineering', Tata McGraw Hill publishing company ltd, second edition, 2007 (Reprint). 28. C.L. Wadhwa, 'Electrical Power Systems', New Age International, fourth edition, 2007.
Website:	www.ieee.org
ONLINE RESOURCES	PPT Presentation Online Objective Questions Videos Materials if any (You tube)

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IT6005 **DIGITAL IMAGE PROCESSING** **L T P C**
3 0 0 3

PREREQUISITE:	Signals and System, Digital Signal Processing												
COURSE OBJECTIVES:	1. To study the image fundamentals and mathematical transforms necessary for image processing. 2.To study the image enhancement techniques 3. To study image restoration procedures. 4. To study the image compression procedures. 5.To study the image segmentation and representation techniques												
COURSE OUTCOMES	CO1	Outline the image formation and the role of human visual system;											
	CO2	Describe the various applications of image processing in industry, medicine, and defense;											
	CO3	Illustrate the signal processing algorithms and techniques in image enhancement;											
	CO4	Analyze image processing techniques to real world problems;											
	CO5	Solve image processing problems and techniques											
CO – PO MAPPING	COURSE OUTCOMES	PROGRAM OUTCOME											
		1	2	3	4	5	6	7	8	9	10	11	12
	CO1	3											
	CO2	3											
	CO3		3										
	CO4		2										
	CO5			2									

UNIT I DIGITAL IMAGE FUNDAMENTALS **8**

Introduction – Origin – Steps in Digital Image Processing – Components – Elements of Visual Perception – Image Sensing and Acquisition – Image Sampling and Quantization – Relationships between pixels - color models.

UNIT II IMAGE ENHANCEMENT 10 Spatial Domain: Gray level transformations – Histogram processing – Basics of Spatial Filtering– Smoothing and Sharpening Spatial Filtering – **Frequency Domain:** Introduction to Fourier Transform
– Smoothing and Sharpening frequency domain filters – Ideal, Butterworth and Gaussian filters.

UNIT III IMAGE RESTORATION AND SEGMENTATION 9 Noise models – Mean Filters – Order Statistics – Adaptive filters – Band reject Filters – Band pass Filters – Notch Filters – Optimum Notch Filtering – Inverse Filtering – Wiener filtering **Segmentation:** Detection of Discontinuities–Edge Linking and Boundary detection – Region based segmentation-Morphological processing- erosion and dilation.

UNIT IV WAVELETS AND IMAGE COMPRESSION **9**

Wavelets – Subband coding - Multiresolution expansions - **Compression:** Fundamentals – Image Compression models – Error Free Compression – Variable Length Coding – Bit-Plane Coding – Lossless Predictive Coding – Lossy Compression – Lossy Predictive Coding – Compression Standards.

UNIT V IMAGE REPRESENTATION AND RECOGNITION **9**

Boundary representation – Chain Code – Polygonal approximation, signature, boundary segments – Boundary description – Shape number – Fourier Descriptor, moments- Regional Descriptors – Topological feature, Texture - Patterns and Pattern classes - Recognition based on matching.

TOTAL: 45 PERIODS

Content beyond Syllabus:	1.NON LINEAR FILTERS FOR IMAGE PROCESSING
Text Books	1. Rafael C. Gonzalez, Richard E. Woods, , Digital Image Processing', Pearson, Second Edition, 2004. 2. Anil K. Jain, , Fundamentals of Digital Image Processing', Pearson 2002.
Reference Books	1. Kenneth R. Castleman, Digital Image Processing, Pearson, 2006. 2. Rafael C. Gonzalez, Richard E. Woods, Steven Eddins,' Digital Image Processing using MATLAB', Pearson Education, Inc., 2004. 3. D,E. Dudgeon and RM. Mersereau, , Multidimensional Digital Signal Processing', Prentice Hall Professional Technical Reference, 1990. 4. William K. Pratt, , Digital Image Processing' , John Wiley, New York, 2002 5. Milan Sonka et aI, 'IMAGE PROCESSING, ANALYSIS AND MACHINE VISION',Brookes/Cole, Vikas Publishing House, 2nd edition, 1999,
Website:	www.nptel.iitm.ac.in ocw.mit.edu
ONLINE RESOURCES	1.PPT Presentation 2.Online Objective Questions 3.Videos Materials if any (You tube)

EC6011 ELECTROMAGNETIC INTERFERENCE AND COMPATIBILITY L T P C

3 0 0 3

PREREQUISITE:	electrical engineering												
COURSE OBJECTIVES:	To tutor the basics of EMI,EMC To instill knowledge on the EMI coupling mechanism and its mitigation techniques To impart comprehensive insight about the current EMC standards and about various measurement techniques To understand the relation between the fields under time varying situations. To understand principles of propagation of uniform plane waves.												
COURSE OUTCOMES	CO1	Find solution to EMI Sources, EMI problems in PCB level											
	CO2	Find solution to EMI Sources, EMI problems in. Subsystem											
	CO3	Find solution to EMI Sources, EMI problems insystem level design											
	CO4	To measure emission immunity level from different systems to couple with the prescribed EMC standards											
	CO5	To measure couple with the prescribed EMC standards											
CO – PO MAPPING	Course Outcomes	Program Outcome											
		1	2	3	4	5	6	7	8	9	10	11	12
	CO1	3	3										
	CO2	3	2		3								
	CO3	3	3										
	CO4	3	2										
	CO5	3		2									

UNIT I BASIC THEORY 8

Introduction to EMI and EMC, Intra and inter system EMI, Elements of Interference, Sources and Victims of EMI, Conducted and Radiated EMI emission and susceptibility, Case Histories, Radiation hazards to humans, Various issues of EMC, EMC Testing categories, EMC Engineering Application.

UNIT II COUPLING MECHANISM 9

Electromagnetic field sources and Coupling paths, Coupling via the supply network, Common mode coupling, Differential mode coupling, Impedance coupling, Inductive and Capacitive coupling, Radiative coupling, Ground loop coupling, Cable related emissions and coupling, Transient sources, Automotive transients.

UNIT III EMI MITIGATION TECHNIQUES 10

Working principle of Shielding and Murphy‟s Law, LF Magnetic shielding, Apertures and shielding effectiveness, Choice of Materials for H, E, and free space fields, Gasketting and sealing, PCB Level shielding, Principle of Grounding, Isolated grounds, Grounding strategies for Large systems, Grounding for mixed signal systems, Filter types and operation, Surge protection devices, Transient protection.

UNIT IV STANDARDS AND REGULATION 9

Need for Standards, Generic/General Standards for Residential and Industrial environment, Basic Standards, Product Standards, National and International EMI Standardizing Organizations; IEC, ANSI, FCC, AS/NZS, CISPR, BSI, CENELEC, ACEC. Electro Magnetic Emission and susceptibility standards and specifications, MIL461E Standards.

UNIT V EMI TEST METHODS AND INSTRUMENTATION **9**

Fundamental considerations, EMI Shielding effectiveness tests, Open field test,TEM cell for immunity test, Shielded chamber , Shielded anechoic chamber, EMI test receivers, Spectrum analyzer, EMI test wave simulators, EMI coupling networks, Line impedance stabilization networks, Feed through capacitors, Antennas, Current probes, MIL -STD test methods, Civilian STD test methods.

TOTAL: 45 PERIODS

Content beyond Syllabus:	Analog, RF & EMC Considerations in Printed Wiring Board Design
Text Books	1. Clayton Paul, "Introduction to Electromagnetic Compatibility", Wiley Interscience, 2006
Reference Books	1. V Prasad Kodali, "Engineering Electromagnetic Compatibility", IEEE Press, Newyork, 2001. 2. Henry W. Ott, "Electromagnetic Compatibility Engineering", John Wiley & Sons Inc, Newyork, 2009 3. Daryl Gerke and William Kimmel, "EDN‟s Designer‟s Guide to Electromagnetic Compatibility", Elsevier Science & Technology Books, 2002 4. W Scott Bennett, "Control and Measurement of Unintentional Electromagnetic Radiation", John Wiley & Sons Inc., (Wiley Interscience Series) 1997.
Website:	www.nptel.iitm.ac.in ocw.mit.edu
ONLINE RESOURCES	PPT Presentation. Online Objective Questions. Videos Materials if any (You tube).

EC6014 **COGNITIVE RADIO** **L T P C**

3 0 0 3

PREREQUISITE:	Digital Communication												
COURSE OBJECTIVES:	1. Students will get an introduction about SDR and Frame relay. 2. Students will be provided with an up-to-date survey of developments in SDR 3. Enable the students to know techniques involved to support real-time traffic and congestion control. 4.Students will be provided with different levels of quality of service (Q.S) to different applications												
COURSE OUTCOMES	CO1	Describe the basics of the software defined radios.											
	CO2	Choose the congestion and traffic management in packet switching and frame relay;											
	CO3	Interpret the traffic and congestion control in Topologies;											
	CO4	Elaborate the knowledge of network planning and optimization;											
	CO5	Measure different levels of quality of service in next generation											
CO – PO MAPPING	COURSE OUTCOMES	PROGRAM OUTCOME											
		1	2	3	4	5	6	7	8	9	10	11	12
	CO1		3										
	CO2				2								

	CO3		3										
	CO4			3									
	CO5			3									

UNIT I INTRODUCTION TO SOFTWARE DEFINED RADIO **9**

Definitions and potential benefits, software radio architecture evolution, technology tradeoffs and architecture implications.

UNIT II SDR ARCHITECTURE **9**

Essential functions of the software radio, basic SDR, hardware architecture, Computational processing resources, software architecture, top level component interfaces, interface topologies among plug and play modules,.

UNIT III INTRODUCTION TO COGNITIVE RADIOS **9**

Marking radio self-aware, cognitive techniques – position awareness, environment awareness in cognitive radios, optimization of radio resources, Artificial Intelligence Techniques.

UNIT IV COGNITIVE RADIO ARCHITECTURE **9**

Cognitive Radio - functions, components and design rules, Cognition cycle - orient, plan, decide and act phases, Inference Hierarchy, Architecture maps, Building the Cognitive Radio Architecture on Software defined Radio Architechture.

UNIT V NEXT GENERATION WIRELESS NETWORKS **9**

The XG Network architecture, spectrum sensing, spectrum management, spectrum mobility, spectrum sharing, upper layer issues, cross – layer design.

TOTAL: 45 PERIODS

Content beyond Syllabus:	LTE Advanced
Text Books	Joseph Mitola III,"Software Radio Architecture: Object-Oriented Approaches to Wireless System Engineering", John Wiley & Sons Ltd. 2000. Thomas W.Rondeau, Charles W. Bostain, "Artificial Intelligence in Wireless communication", ARTECH HOUSE .2009.
Reference Books	1 Simon Haykin, "Cognitive Radio: Brain –Empowered Wireless Communications", IEEE Journal on selected areas in communications, Feb 2005. Hasari Celebi, Huseyin Arslan, "Enabling Location and Environment Awareness in Cognitive Radios", Elsevier Computer Communications , Jan 2008. Markus Dillinger, Kambiz Madani, Nancy Alonistioti, "Software Defined Radio", John Wiley, 2003. Huseyin Arslan, "Cognitive Radio, SDR and Adaptive System", Springer, 2007.
Website:	1 www.nptel.iitm.ac.in ocw.mit.edu
ONLINE RESOURCES	PPT Presentation. Online Objective Questions. Videos Materials if any (You tube).

CS6003 **AD HOC AND SENSOR NETWORKS** **L T P C**
3 0 0 3

PREREQUISITE:	High Speed Networks												
COURSE OBJECTIVES:	1.It deals with the fundamental cellular radio concepts such as frequency reuse and handoff. This also demonstrates the principle of trunking efficiency and how trunking and interference issues between mobile and base stations combine to affect the overall capacity of cellular systems. 2.It presents different ways to radio propagation models and predict the large – scale effects of radio propagation in many operating environment. This also covers small propagation effects such as fading, time delay spread and Doppler spread and describes how to measures and model the impact that signal bandwidth and motion have on the instantaneous received signal through the multi-path channel.												
COURSE OUTCOMES	CO1	Explain the Challenging issues in Wireless Sensor Networks.											
	CO2	Summarize the componential architecture overview.											
	CO3	Distinguish the issues related to networking sensors.											
	CO4	Design and implementation of different protocols.											
	CO5	Develop the simulation of different sensor network platform.											
CO – PO MAPPING	COURSE OUTCOMES	PROGRAM OUTCOME											
		1	2	3	4	5	6	7	8	9	10	11	12
	CO1	3											
	CO2		3										
	CO3		2										
	CO4			3								2	
	CO5			3								2	

UNIT I INTRODUCTION **9**

Fundamentals of Wireless Communication Technology – The Electromagnetic Spectrum – Radio propagation Mechanisms – Characteristics of the Wireless Channel -mobile ad hoc networks (MANETs) and wireless sensor networks (WSNs) :concepts and architectures. Applications of Ad Hoc and Sensor Networks. Design Challenges in Ad hoc and Sensor Networks.

UNIT II MAC PROTOCOLS FOR AD HOC WIRELESS NETWORKS **9**

Issues in designing a MAC Protocol- Classification of MAC Protocols- Contention based protocols- Contention based protocols with Reservation Mechanisms- Contention based protocols with Scheduling Mechanisms – Multi channel MAC-IEEE 802.11

UNIT III ROUTING PROTOCOLS AND TRANSPORT LAYER IN AD HOC WIRELESS NETWORKS **9**

Issues in designing a routing and Transport Layer protocol for Ad hoc networks- proactive routing, reactive routing (on-demand), hybrid routing- Classification of Transport Layer solutions-TCP over Ad hoc wireless Networks.

UNIT IVWIRELESS SENSOR NETWORKS (WSNS) AND MAC PROTOCOLS **9**

Single node architecture: hardware and software components of a sensor node - WSN Network architecture: typical network architectures-data relaying and aggregation strategies -MAC layer protocols: self-organizing, Hybrid TDMA/FDMA and CSMA based MAC- IEEE 802.15.4.

UNIT V WSN ROUTING, LOCALIZATION & QOS **9**

Issues in WSN routing – OLSR- Localization – Indoor and Sensor Network Localization-absolute and relative localization, triangulation-QOS in WSN-Energy Efficient Design-Synchronization-Transport Layer issues

TOTAL: 45 PERIODS

Content beyond Syllabus:	AODV ROUTING PROTOCOL DSR ROUTING PROTOCOL
Text Books	Holger Karl & Andreas Willig, " Protocols And Architectures for Wireless Sensor Networks" , John Wiley, 2005. Feng Zhao & Leonidas J. Guibas, "Wireless Sensor Networks- An Information Processing Approach", Elsevier, 2007.
Reference Books	Kazem Sohraby, Daniel Minoli, & Taieb Znati, "Wireless Sensor Networks- Technology, Protocols, And Applications", John Wiley, 2007. Anna Hac, "Wireless Sensor Network Designs", John Wiley, 2003.
Website:	www.nptel.iitm.ac.in
ONLINE RESOURCES	PPT Presentation Online Objective Questions Videos Materials if any (You tube)

CS6701 CRYPTOGRAPHY AND NETWORK SECURITY L T P C
3 0 0 3

PREREQUISITE:	Computer Networks												
COURSE OBJECTIVES:	1. To know the methods of conventional encryption. 2. To understand the concepts of public key encryption and number theory 3. To understand authentication and Hash functions. 4. To know the network security tools and applications. 5.To understand the system level security used												
COURSE OUTCOMES	CO1	Understand OSI security architecture.											
	CO2	Explain the principles of public key cryptosystems;											
	CO3	Demonstrate detailed knowledge of the role of encryption.											
	CO4	Propose common network security.											
	CO5	Recommend the appropriate procedures required for system security testing.											
CO – PO MAPPING	COURSE OUTCOMES	PROGRAM OUTCOME											
		1	2	3	4	5	6	7	8	9	10	11	12
	CO1	3											
	CO2	3											
	CO3		3										
	CO4			3									
	CO5		3										

UNIT I INTRODUCTION & NUMBER THEORY 10

Services, Mechanisms and attacks-the OSI security architecture-Network security model-Classical Encryption techniques (Symmetric cipher model, substitution techniques, transposition techniques, steganography).FINITE FIELDS AND NUMBER THEORY: Groups, Rings, Fields-Modular arithmetic-Euclid‟s algorithm-Finite fields- Polynomial Arithmetic –Prime numbers-Fermat‟s and Euler‟s theorem-Testing for primality -The Chinese remainder theorem- Discrete logarithms.

UNIT II BLOCK CIPHERS & PUBLIC KEY CRYPTOGRAPHY 10

Data Encryption Standard-Block cipher principles-block cipher modes of operation-Advanced Encryption Standard (AES)-Triple DES-Blowfish-RC5 algorithm. **Public key cryptography:** Principles of public

key cryptosystems-The RSA algorithm-Key management - Diffie Hellman Key exchange-Elliptic curve arithmetic-Elliptic curve cryptography.

UNIT III HASH FUNCTIONS AND DIGITAL SIGNATURES **8**

Authentication requirement – Authentication function – MAC – Hash function – Security of hash function and MAC –MD5 - SHA - HMAC – CMAC - Digital signature and authentication protocols – DSS – EI Gamal – Schnorr.

UNIT IVSECURITY PRACTICE & SYSTEM SECURITY **8**

Authentication applications – Kerberos – X.509 Authentication services - Internet Firewalls for Trusted System: Roles of Firewalls – Firewall related terminology- Types of Firewalls - Firewall designs - SET for E-Commerce Transactions. Intruder – Intrusion detection system – Virus and related threats – Countermeasures – Firewalls design principles – Trusted systems – Practical implementation of cryptography and security.

UNIT VE-MAIL, IP & WEB SECURITY **9**

E-mail Security: Security Services for E-mail-attacks possible through E-mail - establishing keys privacy-authentication of the source-Message Integrity-Non-repudiation-Pretty Good Privacy-S/MIME. **IPSecurity:** Overview of IPSec - IP and IPv6-Authentication Header-Encapsulation Security Payload (ESP)-Internet Key Exchange (Phases of IKE, ISAKMP/IKE Encoding). **Web Security:** SSL/TLS Basic Protocol-computing the keys- client authentication-PKI as deployed by SSLAttacks fixed in v3-Exportability-Encoding-Secure Electronic Transaction (SET).

TOTAL: 45 PERIODS

Content beyond Syllabus:	1.Encryption/Decryption techniques for Image processing
Text Books	1. William Stallings, "Cryptography And Network Security – Principles and Practices", Pearson Education, Third Edition, 2003. 2. Behrouz A. Foruzan, "Cryptography and Network Security", Tata McGraw-Hill, 2007
Reference Books	1. Bruce Schneier, "Applied Cryptography", John Wiley & Sons Inc, 2001. 2. Charles B. Pfleeger, Shari Lawrence Pfleeger, "Security in Computing", Third Edition, Pearson Education, 2003 3. Wade Trappe and Lawrence C. Washington , " Introduction to Cryptography with . coding theory" , Pearson Education, 2007. 5. Wenbo Mao, " Modern Cryptography Theory and Practice" , Pearson Education, 2007..
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